GENERAC®

POWER SYSTEMS, INC.

H-100 Control Panel Technical Manual

This manual should remain with the unit.

SAVE THESE INSTRUCTIONS – The manufacturer suggests that these rules for safe operation be copied and posted in potential hazard areas. Safety should be stressed to all operators and potential operators of this equipment.

Study these SAFETY RULES carefully before installing, operating, or servicing this equipment. Become familiar with this manual and all literature pertaining to the generator set and related equipment. This equipment can operate safely, efficiently, and reliably only if it is properly installed, operated, and maintained. Many accidents are caused by failing to follow simple and fundamental rules or precautions.

Generac cannot anticipate every possible circumstance that might involve a hazard. The warnings in this manual, and on tags and decals affixed to the equipment, are, therefore, not all inclusive. If using a procedure, work method, or operating technique the manufacturer does not specifically recommend, ensure that it is safe for others. Also make sure the procedure, work method, or operating technique utilized does not render the equipment unsafe.

⚠ GENERAL HAZARDS ⚠

- For safety reasons, the manufacturer recommends that this equipment be installed and serviced by an Authorized Service Dealer or other qualified electrician or installation technician who is familiar with applicable codes, standards, and regulations. The operator also must comply with all such codes, standards, and regulations.
- When working on this equipment, remain alert at all times. Never work on the equipment when physically or mentally fatigued.
- Inspect the equipment regularly, and promptly repair or replace all worn, damaged or defective parts, using only factory-approved parts.
- Before performing any maintenance on the generator or any related equipment, disconnect the generator's battery cables and remove panel fuse to prevent accidental startup. Disconnect the cable from the battery post, indicated by a NEGATIVE, NEG, or (–) first. Reconnect that cable last.

⚠ ELECTRICAL HAZARDS ⚠

- Generators produce dangerous electrical voltages and can cause fatal electrical shock. Avoid contact with bare wires, terminals, connections, etc., while the generator and related equipment are running. Ensure all appropriate covers, guards, and barriers are in place before operating the equipment. If working around an operating unit, stand on an insulated, dry surface to reduce potential shock hazards.
- Do not handle any kind of electrical device while standing in water, while barefoot, or while hands or feet are wet. DANGEROUS ELECTRICAL SHOCK MAY RESULT.
- If people must stand on metal or concrete while installing, operating, servicing, adjusting, or repairing this equipment, place insulative mats over a dry wooden platform. Work on the equipment only while standing on such insulative mats.
- Wire gauge sizes of electrical wiring, cables, and cord sets must be adequate to handle the maximum electrical current (amperage) to which they will be subjected to.
- Before installing or servicing this equipment, make sure that all power voltage supplies are positively turned off at their source. Failure to do so will result in hazardous and possibly fatal electrical shock.
- When installed with an automatic transfer switch, the generator may crank and start anytime, without warning. To prevent injuries caused by sudden start-up, disable the generator's automatic start circuit before working on, or around, the unit. Then, place a "Do Not Operate" tag on the generator control panel and on the transfer switch.
- In case of an accident caused by electric shock, immediately shut down the source of electrical power. If this is not possible, attempt to free the victim from the live conductor. AVOID DIRECT CONTACT WITH THE VICTIM. Use a nonconducting implement, such as, a rope or board, to free the victim from the live conductor. If the victim is unconscious, apply first aid and get immediate medical help.
- Never wear jewelry when working on this uipment. Jewelry can conduct electricity, resulting in electric shock, or may get caught in moving components, causing injury.

⚠ FIRE HAZARDS ⚠

- For fire safety, the generator and related equipment must be installed and maintained properly. Installation always must comply with applicable codes, standards, laws, and regulations. Adhere strictly to local, state, and national electrical and building codes. Comply with regulations the Occupational Safety and Health Administration (OSHA) has established. Also, ensure that the equipment is installed in accordance with the manufacturer's instructions and recommendations. Following proper installation, do nothing that might alter a safe installation and render the unit in noncompliance with the aforementioned codes, standards, laws, and regulations.

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AUTHORIZED SERVICE DEALER LOCATION

To locate the nearest AUTHORIZED SERVICE DEALER, please call this number:

1-800-333-1322

DEALER LOCATION INFORMATION CAN BE OBTAINED AT THIS NUMBER, or visit the website at www.generac.com.

INTRODUCTION

The H-100 Control Panel is an electronic control box that functions as an advanced standby generator controller. Its technology is based on the flagship PM-DCP system with all its flexibility included. A familiar user interface in the form of GenLink®-DCP is used to program, monitor and change the parameters in the unit. The interface appears the same as it does for the PM-DCP.

Specialized programs are built into the H-100 Control Panel to allow customers to configure spare I/O to their own needs. For example, built in Integrated Logic Controller (ILC) logic can eliminate the need for ancillary external controllers. Everything can be user customized from measurements to alarms to the screen displays.

Why do we do this? Having one set of control firmware buys us the economy of scale which can be passed on to the customer. It also has great technical advantages. The H-100 Control Panel and all PM-DCP products are built around a common "core" of firmware. This provides EVERY product with the same technical tools. For example, both the H-100 Control Panel and PM-DCP products can call out for assistance via a modem, every product can provide trending data for its measured parameters, any measured value can be setup to create alarms or warnings, each product has a built in ILC, etc. H-100 Control Panel is very flexible.

FEATURES

- Local/remote connection to a PC for GenLink®-DCP communication.
- Interface with up to four Generac Commercial Transfer Switches (HTS).
- Interface with up to two Remote Annunciator Panels.
- Customizable display.
- New Generation GenLink.
- Built-in Frequency and Voltage controller.
- External modem option with dialout capability upon alarm.
- Communication via standard CAN bus and Modbus protocols.
- Programmable I/O channel properties.
- Programmable alarm/warnings.
- Alarm and event logging with time stamping.
- Parameter logging and trending both to file and graphical.
- Built-in diagnostics.
- Internal ILC for combinatorial logic functions including analog inputs.
- Spare customer programmable Analog input capacity.
- Spare customer programmable Digital I/O capacity.
- Firmware can be updated via Telephone line.

PANEL SETUP

◆ CHANGING THE CONTROLLER CONFIGURATION

The H-100 Control Panel controller is setup in the factory to match the product it is shipped with and generally no changes are required. For spares purposes the controller can be re-configured in the field using the GenLink software tool and a PC.

If you need to change the function of the panel the best way to get a basic setup for a product is to use GenLink to download a "product file". This will setup all the basic parameters and just leave customization and calibration to be done. Product files are available on the web site for downloading cross referenced to product serial numbers/generic product types. The manufacturer does not recommend changing the settings individually for a product as this is laborious and prone to human error. Some of the settings require detailed knowledge of things like governor settings which are not easily discernable.

Some configurations are changeable from the H-100 Control Panel touch pad and displays. These configurations will be described later and include:

- Setting Display Contrast
- Setting System Time and Date
- Setting up/Enabling Internal Exercise
- Enabling Interface with Generac Commercial Transfer Switch (HTS)

◆ CUSTOMIZATION

The controller is designed to be very flexible and allow great levels of customization via the GenLink tool. Once you have customized your controller, you should save the settings away to floppy or hard disk for backup. This can be done during the customization process, or at any time subsequent to customization by uploading the settings from the controller to GenLink and then saving them to disk. The digital outputs can be set to turn on from any one of a list of functions, or they can be used as part of the built-in ILC. The digital inputs can be moved, inverted, renamed, given delay times, made alarms, used in the ILC, logged/not logged, etc. Refer to the section "MEASUREMENT ENGINE" for details. Analog inputs are dealt with in the same section.

There are some parameters which are specific to the product, such as an engine controller or transfer switch. These are all customizable via GenLink. Refer to the relevant section for details.

THE MEASUREMENT "ENGINE"

The measurement “engine” is the key feature of the system. All the inputs to the controller are processed by this module. Each physical input is measured and the result processed by an individual set of rules that are set via a PC and GenLink. Normally, a product is delivered with the inputs and outputs pre-configured and nothing needs to be done, however the manufacturer has provided complete flexibility to each measurement (except where product safety is concerned). The inputs are divided into analog and digital channels.

◆ ANALOG CHANNELS

There are 23 analog channels of which 14 have fixed functions. The remaining 9 channels are split between product specific inputs (such as oil temperature), and customer spares. The exact split depends on the product. Table 1 shows the channel allocation.

Some of the 14 fixed channels are “DERIVED” readings in that they are calculated from the other readings. For example, power is calculated from both voltage and current. These are not real hardware channels, but they result in an analog reading that can be treated as a “fixed channel” just like any other.

◆ ANALOG MATHS

Each of the 23 channels is processed by a set of measuring rules using constants that are set via GenLink. Usually these constants can be changed by the customer. In the following illustration, the measurement is represented by M and the GenLink constants are in italics. The measurement is processed in the following order and the result is then stored for customer display or use.

M = M * *Calibration Factor*

This is used to calibrate out any reading inaccuracies where calibration factor is a number such that 1024 is equivalent to 1, so it’s really M * calibration factor/ 1024. GenLink will hide this computation so you can enter floating point numbers such as 1.1 or 0.987 etc.

THEN

M = M processed by function x:

Table 1

CPU Channel No.	Channel Title	Update Rate	Derived Value
7	User Configurable #1 (Usually Oil Temp)	3.84 ms	No
8	User Configurable #2 (Usually Coolant Temp)	3.84 ms	No
9	User Configurable #3 (Usually Oil Pressure)	3.84 ms	No
10	User Configurable #4 (Usually Coolant Level)	3.84 ms	No
11	User Configurable #5 (Usually Fuel level)	3.84 ms	No
12	User Configurable #6 - Spare -	3.84 ms	No
13	User Configurable #7 (Usually throttle position)	3.84 ms	No
14	Special Oxygen sensor	3.84 ms	No
15	Special Battery charge sensor	3.84 ms	No
16	Battery Voltage/ PSU voltages	3.84 ms	No
1	Generator Phase A RMS Current	Phase A ZERO CROSSING	No
2	Generator Phase B RMS Current	Phase B ZERO CROSSING	No
3	Generator Phase C RMS Current	Phase C ZERO CROSSING	No
-	Generator average current	Every Phase ZERO CROSSING	Yes
4	Generator Phase A RMS Voltage	Phase A ZERO CROSSING	No
5	Generator Phase B RMS Voltage	Phase B ZERO CROSSING	No
6	Generator Phase C RMS Voltage	Phase C ZERO CROSSING	No
-	Generator average voltage	Every Phase ZERO CROSSING	Yes
-	Total Generator Power KW	Every Phase ZERO CROSSING	Yes
-	Total Generator Power Factor	Every Phase ZERO CROSSING	Yes
-	Generator Frequency	Every Phase ZERO CROSSING	Yes
-	RPM #1	4 - 8 ms variable (geared)	Yes
-	Oxygen sensor zero crossings	Every O2 ZERO CROSSING	No

Where x can be:

1. THERMISTOR
2. CURRENT
3. LINEAR
4. PRESSURE
5. UNALTERED
6. POLY_3RD
7. POLY_2ND
8. POLY_1ST
9. POLY_1ST_N1
10. POLY_1ST_N2
11. CAL_SCALE
12. CFM_SENSOR
13. GEN_FP_POLY

The function x may use any of the coefficients 1,2,3 and in some cases will use calibration factor as a 4th coefficient (in this case use scaling factor for calibration). The coefficients are used to allow adjustment of the basic functions to cater for future or alternate sensors. They perform different tasks in different functions, see APPENDIX A for further details. Note that if calibration factor is used as a coefficient, it will be shown (and entered) by GenLink as (actual coefficient/1024).

For example, if the coefficient is -378, it will be displayed as -0.36914.

THEN

M =M * *Scaling Factor*:

Where *scaling factor* is a number such that 1024 is equivalent to 1, so it's really M * *scaling factor*/1024. GenLink will hide this computation so you can enter floating point numbers such as 2.1 or 0.987 etc.

◆ ANALOG ALARMS

Each of the 23 channels is processed by a set of alarm rules using constants that are set via GenLink. Usually these constants can be changed by the customer. Note that all alarms will be entered into the alarm log and will operate the audible alarm. Warnings will operate the audible alarm also, and will be put in the alarm log. The following list shows the alarm properties.

Types

This section is used to turn alarms and warnings on or off and define if the input must be greater than a value (GT) or less than a value (LT). There can be up to 2 alarms and 2 warnings, of which there can be a maximum of 2 GT or LT types.

Setpoints

There can be up to 4 setpoints to support 2 alarms and 2 warnings, of which there can be a maximum of 2 GT or LT types. The setpoints are in the same units that the measurement is displayed in.

Delay Time

There are 2 delay fields that can be set with different times in each. Any or none of these times can be applied to any of the alarms or warnings via GenLink radio buttons.

For example, a measurement may have to be greater than the setpoint for 1 second to cause an alarm, or less than another setpoint for 2 seconds to cause a warning. The resolution of this time interval is 0.1 seconds.

Hysteresis

Applied hysteresis in display or final units (for example battery voltage is displayed in units of 1/100ths of a volt). When an alarm/warning has gone active, the hysteresis is subtracted from the GT setpoint or added to the LT setpoint to calculate the modified setpoint needed to make the alarm go inactive.

Shutdown

When set, this alarm condition (alarms only, not warnings) has been selected to shutdown the engine.

Dialout

When this field is set, the dialout feature is selected. If an alarm or warning occurs for this channel the processor will automatically call for assistance via telephone (if the external modem option is fitted). Dialout can be selected either for warnings, alarms, neither, or both. There is a predefined and prioritized list of 10 phone numbers that will be tried. The controller expects GenLink to answer the call and log the fault. It is possible for the customer to program any Modbus device with a modem to respond to the call.

Active When

You can select other criteria to determine when alarms and warnings become active. This is further divided in that you can define these criteria independently for LT and GT alarm types.

ALWAYS ENABLED = This alarm or warning is always enabled under every circumstance.

HOLD OFF = Alarms/Warnings with this qualification only become active after a programmable hold off time has been met. The hold off timer starts after the engine has started. Stopping the engine cancels the hold off timer.

IMMEDIATE = Alarms/Warnings with this qualification only become active immediately after the engine has started.

Sensor Failure Check

When this field is set, the input sensor is checked for short circuit or open circuit failure. Normally each of the inputs are conditioned externally to be 4-20mA current loops. Any currents outside this range indicate a sensor failure. This will cause an alarm to occur. The alarm can be selected to shut down the engine if so desired via the next field. The alarm will be entered in the alarm log.

Shutdown on Sensor Failure

When this field is set, the engine will shut down if there is a sensor failure. If the field is unchecked, the failure will just cause an alarm message to appear and the audible alarm to sound. The alarm will be entered in the alarm log.

◆ OTHER ANALOG OPTIONS

Event Log

When set, the channel measurement is compared to the setpoint with either the GT or LT options. Once the condition is met (eg measurement GT setpoint) the event is logged along with a date/time stamp into the volatile memory based event log. Six other parameters that can be chosen by the customer will also be logged. Volatile means that when power is removed from the unit, the memory will be lost.

Analog Outputs

There are no analog outputs available for customization.

◆ ANALOG SENSOR RATINGS

Typically the sensors used by the manufacturer have the following ratings:

Temperature	35 - 300 deg. F
Pressure	0 - 150 psi

OUTPUT FUNCTIONS

Output functions are flags that are set/reset by the internal program to indicate a certain status, for example “Engine Running”. The Measurement Engine allows these flags to be treated as “channels” that can be made into alarms/warnings, display messages, operate real outputs and also be fed as inputs to the ILC. For example, use the “Ready To Start” output function to operate a relay by mapping it to a physical output via GenLink, or you could feed it into the ILC to do combinatorial logic.

See TABLE OF OUTPUT FUNCTIONS in appendix B.

◆ SPARE ANALOG CHANNELS

Depending upon the particular configuration of your product, the following input channels may be available for custom measurements:

Channel #	Normal function
4	Coolant level
5	Fuel Level
6	Spare
7	Throttle position
8	Oxygen sensor 0-1Vdc
9	Battery charge current 0-5Vdc

ENGINE MANAGEMENT

The engine management module is very similar to that used in the manufacturer's other products. It controls engine cranking, engine starting, engine running and engine stopping. These functions are performed to a set of “rules” that can be customized via parameters from GenLink. In turn, the module needs to know certain things about the engine which it expects to be programmed in from GenLink.

◆ GENERATOR PARAMETERS

- Engine Flywheel Teeth — Number of flywheel teeth or pulses per revolution for RPM input. RPM 1 is used for the engine controllers.
- CT Ratio/Generator — Current Transformer ratio for the generator. This value is the result from reducing the CT ratio. E.G. If the CT ratio is 100 amps to 5 amps, the resulting value is 20. Normally, the CT ratio will be x amps to 1 amp on H-100 Control Panels.
- Generator Phase Configuration — Select either single-phase or three-phase configuration depending on how the unit is supplied.
- 60 Hertz RPM — The engine RPM needed to supply 60 Hertz power.
- Quiet-Test® RPM — The engine RPM used when running Quiet-Test®.

Number	PARAMETER	UNITS
1	Engine Flywheel Teeth	Teeth
2	CT Ratio - Generator	-
3	Generator Phase Configuration	1 or 3
4	60 Hertz RPM	RPM
5	Quiet-Test® RPM	RPM

◆ ENGINE SETTINGS

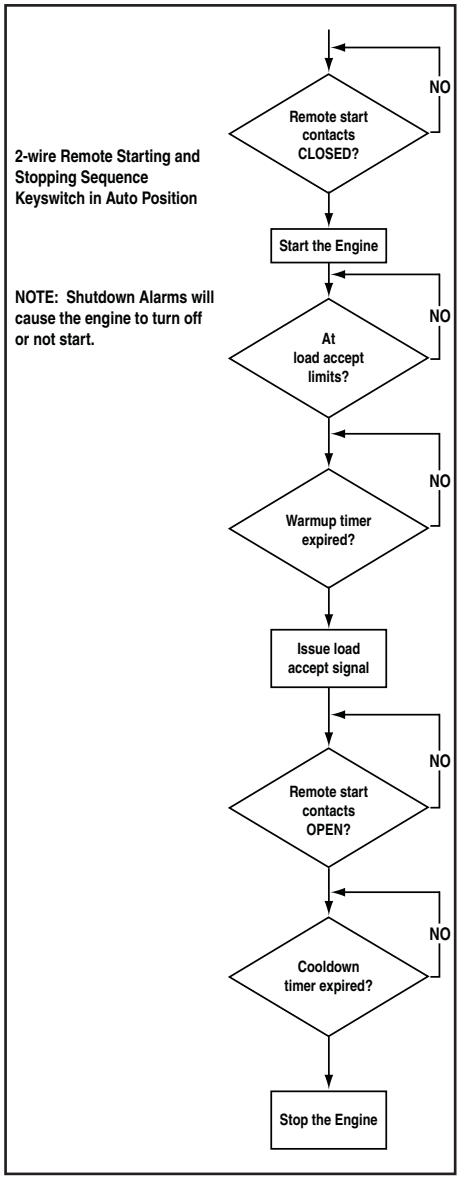
All of the following times are in seconds:

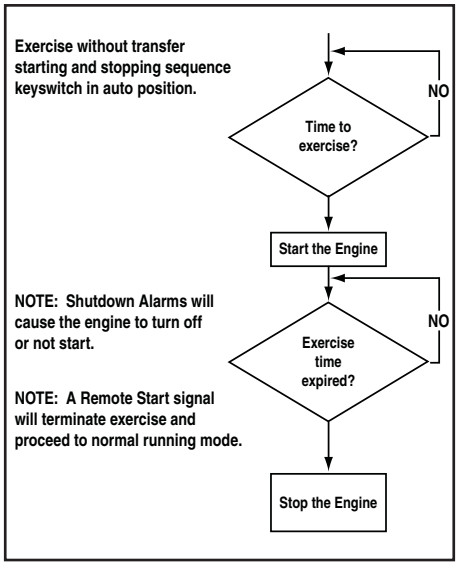
- Preheat Time — The time preheat is applied for before cranking if enabled.
- Start Detection RPM — The Engine must reach this RPM before disengaging the starter.
- Crank Time — The maximum time in seconds that each crank will last
- Alarm Hold-off Time — The time after starting at which the hold-off alarms become enabled.
- Engine Warmup Time — The engine will run for at least this time before issuing the “Accept load” signal.
- Target Frequency — The target generator frequency (Hz).
- Target Voltage — The target generator voltage (RMS).
- Preheat Enable — The following four options are selectable (only for Diesel):
  - Preheat disabled.
  - Preheat during cranking.
  - Preheat before and during cranking.
  - Preheat before and during cranking and until load ready.

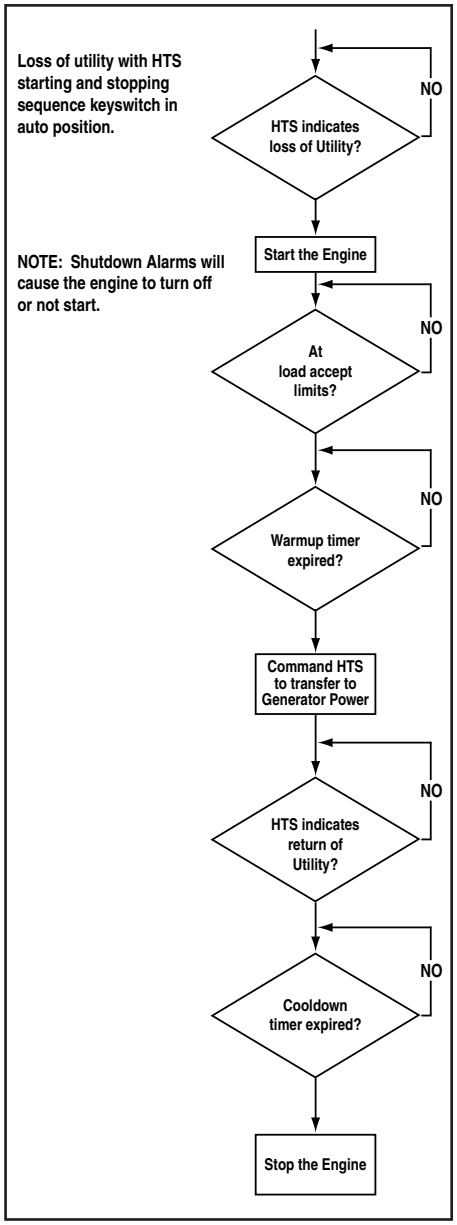
  The Preheat output pin shares its function with the Air/Fuel Solenoid output. You must choose one of the two functions as follows:
  - To select Air/Fuel - set the “Diesel” parameter on the governor settings page to “No”. Set Preheat to “Disabled”
  - To select Preheat - set the “Diesel Y/N” parameter on the governor settings page to “Yes”. Set Preheat to one of the enable selections.
- Engine Cooldown Time — The generator will run for at least this time after remote start becomes inactive.
- Pause Between Cranks Time — The time between each successive crank operation.
- Number of Start Attempts — The maximum number of times the engine will attempt to start (crank) before faulting out with overcrank.
- Load Accept Frequency — The generator must reach this frequency before issuing the “Accept load” signal.
- Load Accept Voltage — The generator must reach this voltage before issuing the “Accept load” signal.

Number	PARAMETER	UNITS
1	Preheat Time	(S)econds
2	Start Detection RPM	RPM
3	Crank Time	S
4	Alarm Hold-off Time	S
5	Engine Warmup Time	S
6	Target Frequency	Hz
7	Target Voltage	Vrms
8	Preheat Enable	-
9	Engine Cooldown Time	S
10	Pause Between Cranks Time	S
11	Number of Start Attempts	-
12	Load Accept Frequency	HZ
13	Load Accept Voltage	Vrms

STARTING AND STOPPING - SEQUENCE DIAGRAMS







VOLTAGE REGULATOR (OPTION)

All panels include automatic voltage regulation as standard. There are various settings that can be made to the voltage regulator via GenLink. The settings are normally factory preset and are shown here for completeness.

- Voltage KP/KI/KD — Voltage regulation stability constants.
- PMG — YES indicates a Permanent Magnet Excited alternator.
- VF Corner 1 / 2. — These are used for v/f control to reduce the output voltage when a large load is applied that slows down the generator. If the frequency drops below these setpoints, the voltage is reduced proportionally as the frequency drops according to the Volts per Hertz ratio.
- Panel Type — Indicates the panel type that the H-100 Control Panel has been programmed to be. It will normally be H-100.
- Volts per Hertz — Number of volts to reduce the generator voltage for each hertz below VF Corner 1 frequency.
- AVR Dump Improve — Makes the regulator module increase the gain temporarily on a load dump to improve the transient voltage response.
- Unit Rated Power — This is the generator's rated power in kW.

Voltage Regulator (Option) Chart

NO.	PARAMETER	UNITS
1	Voltage KP	-
2	Voltage KI	-
3	Voltage KD	-
4	PMG	Y/N
5	VF Corner 1	Hertz
6	VF Corner 2	Hertz
7	Panel Type	-
8	Volts per Hertz	V/Hertz
9	AVR Dump Improve	Y/N
10	Unit Rated Power	kW

GOVERNOR (SPEED REGULATOR) OPTION

All panels include automatic frequency (speed) regulation as standard. There are various settings that can be adjusted for the governor via GenLink, these include the target frequency. The settings are normally factory preset and are shown here for completeness, they do not apply to all governor types.

- Standby KP,KI,KD — Frequency regulation stability constants used for normal mode operation.
- QuietTest® KP,KI,KD — Frequency regulation stability constants used for QuietTest® mode operation.
- Actuator Type — Indicates the type of governor actuator. The following types are available:
  - POWERFLOW — Barber Coleman Powerflow, voltage driven without position feedback
  - BOSCH GAS — Bosch Butterfly, current driven with position feedback
  - LINEAR CURRENT — Linear, Current Driven without position feedback
  - DETROIT DIESEL — Detroit diesel PWM Driven
  - BOSCH HORIZONTAL DIESEL — Bosch Diesel Arm with Horizontal Connecting Rod and current driven with position feedback
  - BOSCH VERTICAL DIESEL — Bosch Diesel Arm with Vertical Connecting Rod and current driven with position feedback
- Actuator Offset — Number corresponding to lowest actuator position (Close Throttle).
- Actuator Fullscale — Number corresponding to highest actuator position (Open Throttle).
- Actuator Normal Start Position — The position the actuator will be parked at from start up until the "Start detection RPM" is reached. If "soft start" is enabled, this is also the maximum position of the throttle until the Target Frequency - 3 Hz is reached. Therefore, if "soft start" is enabled, the actuator start position MUST be high enough to reach, Target Frequency - 3 Hz.
- Actuator QuietTest® Start Position — The position the actuator will be parked at from start up until the "Start detection RPM" is reached. If "soft start" is enabled, this is also the maximum position of the throttle until the QuietTest® Target Frequency - 3 Hz is reached. Therefore, if "soft start" is enabled, the actuator start position MUST be high enough to reach, QuietTest® Target Frequency - 3 Hz.
- Soft Start Time — The time to stay at each soft start step before moving on to the next step. (Only applies if soft start is enabled).
- Soft Start Frequency — An entry of 0 Hz disables soft start. Any other value enables soft start which ramps up the generator frequency at a rate determined by "Soft Start Time" to minimize smoke. This value selects the first frequency to target after start up. Once this frequency is attained, the generator will hold this frequency for the "Soft Start Time" and then move to the next step. Each step is 3 Hz higher with the final step being "Target Frequency" - 3 Hz. Each step is held for the "Soft Start Time". During soft start, the throttle will not be allowed to exceed the "Actuator Start Position".
- Diesel — Indicates if this is a diesel powered generator. This modifies such features as frequency control, and others.

- Dump Enable — Indicates if extra load dump governor compensation is desired to reduce increase in frequency caused by drop in load. The following three selections are available:
  - No Dump — No additional compensation.
  - Dump — Reset governor algorithm when load dump detected.
  - Dump & Hold — Same as Dump, but also hold throttle closed until frequency back in range.
- Engine Linearization — Selects engine torque to actuator position translation curve for Bosch Actuators.
  0 = No conversion - torque = position
  1 = Butterfly Actuator with minimum position same as unpowered actuator
  2 = Diesel arm with Horizontal rod
  3 = Diesel arm with Vertical rod
  4 = Same as 1, but minimum position at actuator mechanical stop
  5 = Same as 4, but with limited position resolution of 1
  6 = Same as 4, but with added energy to accommodate throttles that normally operate in the nearly closed position at no load
- Integral limit/Antiwindup — Choose whether to use an integral limit or an anti-windup strategy.
  YES = integral limit
  NO = anti-windup
- Limit/windup parameter — If “Integral Limit” is selected, this is the maximum value the integral is allowed. If “Anti-Windup” is selected, this is the integral value above which the anti-windup algorithm becomes active.
- Pwm Counts per ampx10 — Number of PWM counts required to drive one tenth of an amp into a linear current driven actuator. This only applies to the “Linear Current” actuator type.
- Desynch Offset — Offset of –0.9 to +0.9 Hertz to be applied to the target frequency to improve passive synchronizing by Automatic Transfer Switches. If an in-phase or synchronized transfer is required, use this setting to adjust the generator frequency to 0.1 Hz above nominal Utility frequency.

Governor (Speed Regulator) Option Chart

NO.	PARAMETER	UNITS
1	Standby KP	-
2	Standby KI	-
3	Standby KD	-
4	QuietTest® KP	-
5	QuietTest® KI	-
6	QuietTest® KD	-
7	Actuator Type	-
8	Actuator Offset	-
9	Actuator Fullscale	-
10	Actuator Normal Start Position	-
11	Actuator QuietTest® Start Position	-
12	Soft Start Time	Seconds
13	Soft Start Frequency	Hz
14	Diesel	Y/N
15	Dump Enable	-
16	Engine Linearization	-
17	Integral limit/Antiwindup	Y/N
18	Limit / windup parameter	-
19	Pwm Counts per ampx10	-
20	Desynch Offset	Hz

TRENDING

Just like in the PM-DCP, there are two types of trending available - Remote and Local.

◆ REMOTE TRENDING

GenLink performs remote trending by polling the controller for the selected data at the desired rate. Up to 8 analog channels can be monitored at a 0.3 second rate. If a faster rate is desired, reducing the number of analog channels monitored will allow for a 0.1 second rate. The polling rate can be varied from 0.1 seconds to several hours. GenLink can save the data to a file and/or display it as a near real-time graph. The file is MS Excel compatible (CSV format). Examples of things you can trend are the generator frequency response (in 0.1 second steps) to a block load or Generated power over a day.

◆ LOCAL TRENDING

Local trending is done inside the controller where up to 1000 samples can be stored in memory. GenLink provides an interface to select the analog channels to be trended, the rate to be sampled at, and optional triggers to be used to specify when to sample. Up to 6 analog channels can be sampled. However, the 1000 samples are divided by the number of channels. For example, there will be 1000 samples of 1 channel or only 166 samples of each of 6 channels. The analog samples can be sampled at one of three basic polling rates: Low Speed, Mid Speed, and High Speed. For the Low Speed and Mid Speed modes, there are also several settings that can be used to determine when to sample. GenLink can save the data to a file and/or display it as a snap-shot graph. The file is MS Excel compatible (CSV format).

◆ GENLINK LOCAL TRENDING SETUP

When setting up the local trending, verify that the "Armed" box is unchecked and press "Apply". To change the settings with the trending armed may result in corrupted data. Select a rate at which to take samples.

- Low Speed rate samples the processed analog channel values at a rate that is able to be set in increments of 0.1 seconds.
- Mid Speed rate is about 2 milliseconds which captures the new analog channel value as soon as it is processed by the measurement and alarm modules.
- High Speed rate is 0.4 milliseconds and is reserved for the raw AC wave forms of generator voltage and current.

There are 6 pull-down boxes that allow the selection of up to 6 analog channels. All channel pull-down boxes after the first pull-down box with NULL CHANNEL selected are ignored. If High Speed is selected, the pull-down boxes are not used. Instead, there are 6 check boxes that can be used to select which voltage and current lines are to be trended.

The "Capture When" pull-down box allows the trending to be limited to the engine running or engine being stopped. If the "Stop at End of Buffer" box is selected, then the trending will start when the "Capture When" condition is true and stop when the 1000 samples have been taken.

Any digital or analog channel can be used as an event trigger. The event trigger needs to be set up in that channel's setup screen. Checking the "Capture Only When Trigger is True" box will cause the samples to only be taken while the event trigger is true. Checking the "Capture on Shutdown Alarm" will cause the samples to start upon the setting of a shutdown alarm. The event trigger can be used to start sampling, stop sampling, or center the sampling by selecting the appropriate radio button:

No Trigger

The event trigger is ignored and samples are continually being placed into the buffer.

Pre-Trigger

Samples are continually being placed into the buffer until the event trigger becomes true. Then no more samples are placed into the buffer.

Post-Trigger

No samples are placed into the buffer until the event trigger becomes true. Then samples are placed in the buffer until it is full.

Pre- and Post-Trigger

Samples are continually being placed in the buffer until the event trigger becomes true. This point is considered ½ of the buffer. Samples continue to be placed into the buffer until it is full.

Pressing the "View" button will show a graph of the samples in the buffer at the time the button is pressed. The graph has a "Save" button that allows the user to save the data out to a file in a MS Excel compatible (CSV) format.

THE ILC

The built-in ILC uses simple combinatorial logic to generate digital outputs and limited generator control. The ILC uses ladder logic for programming, and a separate offline programming tool is available to generate the ILC programs. These are then downloaded via GenLink and are started or stopped by means of a checkbox on the GenLink ILC page. Once downloaded and started, they will remain active unless they are stopped via GenLink, even if power is cycled.

The I/O scan time of the ILC is about 100 ms worst case. This means that all inputs and outputs are scanned within 100 ms. Also, the ILC processes one rung every 5 ms, so 5 rungs will take 25 ms. However, this is in parallel with the I/O scan and not added to it.

The offline tool uses graphic symbols to design the "rungs" of the ladder logic. The rungs are simple and can only have 2 combinatorial elements in them, but by the use of "soft contacts" the output of one rung can be fed into the input of another to provide more combinations. As well as the logical combinations, there are also analog comparisons, counters and timers available for use in the rungs. As an example this allows the following type of logic to be built:

IF (in automatic) AND (engine running) AND (air temperature >25 deg) FOR (20 seconds) THEN OPERATE (output 7).

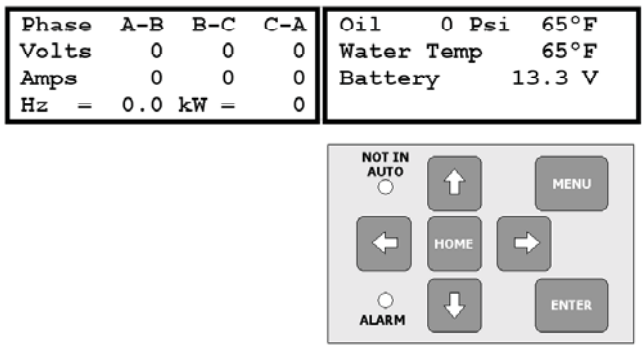
Generator control is limited to the following output options (referred to as “Hooks”).

1. Use Keyswitch
2. Force Off – cleared with “Use Keyswitch” hook
3. Force Manual – cleared with “Use Keyswitch” hook
4. Force Auto – cleared with “Use Keyswitch” hook
5. Force Dialout
6. Halt ILC
7. Force Alarm/Warning #1
8. Force Alarm/Warning #2
9. Force Remote Start

For detail in programming the ILC, refer to the ILC manual.

THE FRONT PANEL DISPLAY

The front panel display consists of two LCD displays that are 4 rows of 20 characters each and a key pad with seven buttons and two LEDs.



◆ LEFT DISPLAY

The left display is used to display a “fixed” set of parameter pages and has no cursor or entry fields. The key pad has no direct control of its contents. Its contents are determined by a menu selection on the right display.

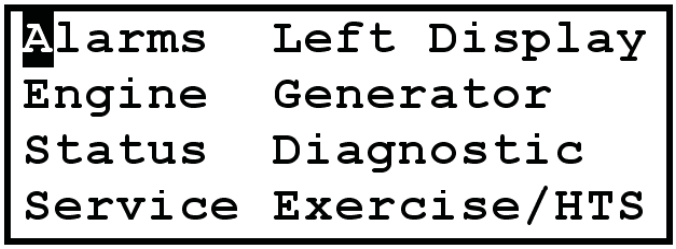
◆ RIGHT DISPLAY

The right display has several pages and responds directly to the key pad. There are two “quick” buttons on the key pad that are used to go directly to either the Home page or the Menu page. The Enter button is used to enter and exit edit mode, operate an output override, or select another page. When not in edit mode, the arrow buttons are used to navigate around the page to either an edit field or a control field. When in edit mode, the up/down buttons slew up or down through the available values and the right/left buttons are used to change to a different digit or edit field. Moving off an edit field while in edit mode automatically enters the value displayed. Also, while in edit mode, pressing the Home button will return the parameter to the last value entered.

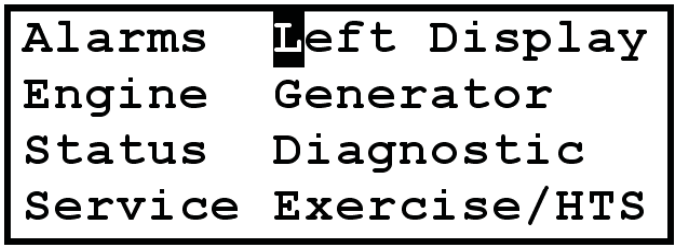
◆ LEFT DISPLAY PAGES

The left display has five “fixed” parameter pages: System Voltages, System Power, Transfer Switch Mimic Diagram, Generator Frequency Graph, and System Alarm Log. A sixth page is selectable, but has no function at this time. The left display page is determined by selecting the right display menu item, “Left Display”. To change the left display, do the following:

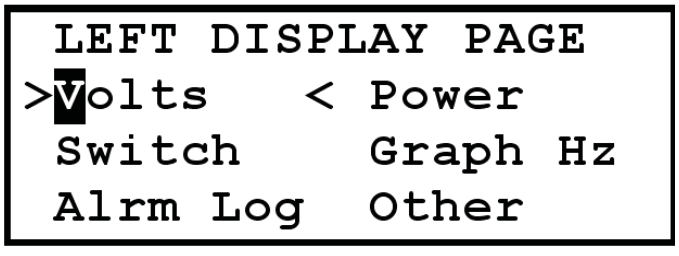
Press the “MENU” button.



Press the ➔ button to move to the “Left Display” field.



Press the “ENTER” button to display the “Left Display” menu page.



The “>.....<” indicates which page is currently displayed on the left display. Use the arrow buttons to move the cursor to the desired page name and press the “ENTER” button. The left display will change to the new page and the “>.....<” will move to the selected page name.

> Volts <

```
Phase   A-B   B-C   C-A
Volts   208   208   208
Amps      0     0     0
Hz   = 60.0 kW =      0
```

This is a typical three phase System Voltages page.

LINE 1: Phase titles for the voltage and current.

LINE 2: Line-to-line voltages in Volts RMS.

LINE 3: Line currents in Amps RMS.

LINE 4: Generator frequency in Hz and total system power in kilowatts.

```
Phase AB/N AN/A BN/B
Volts  240  120  120
Amps     0    0    0
Hz   = 60.0 kW =    0
```

This is a typical single phase System Voltages page.

LINE 1: Phase titles for the voltage and current – voltage title/current title.

LINE 2: Line-to-line voltage for AB and Line-to-Neutral voltage for A and B in Volts RMS.

LINE 3: Neutral current and Line currents in Amps RMS.

LINE 4: Generator frequency in Hz and total system power in kilowatts.

> Switch <

```
Transfer Switch Name
UTILITY     GENERATOR
_____________/ _____
             |
```

This is the Transfer Switch Mimic Diagram page. It shows the position of the Utility Switch and the Generator Switch. This depicted display shows the Utility switch closed and the Generator switch open. There can be up to 4 HTS switches connected to the generator.

LINE 1: "Transfer Switch Name" indicates which switch inputs are being displayed such as "From HTS #1". To select a switch to display, select the switch number on the HTS page (refer to the Right Display Pages - Exercise/HTS page). If there are no HTS switches connected, then the Line Power and Generator Power inputs are displayed and the "Transfer Switch Name" is "From Line/Gen Inputs"

LINE 2: Title line showing the left side is the Utility switch and the right side is the Generator switch.

LINE 3: Character graphics showing the switch states – open or closed.

LINE 4: Character graphics indicating the load coming off the bottom of the diagram.

> Alrm Log <

```
01 mm/dd/yy hh:mm:ss
Alarm/Warning msg
02 00/00/00 00:00:00
?? (undefined)    Lo
```

This is the System Alarm Log page. It displays the last 20 alarms or warnings that occurred with a time and date stamp. Two records are displayed at a time.

LINE 1/3: The record's alarm or warning number (lowest number being the most recent) followed by the date and time that the alarm or warning occurred.

LINE 2/4: The alarm or warning description message. The depicted display shows a basic format in place of the first record and an empty record for the second. The records scroll up at about a 4 second rate.

The message format symbols are explained below:

First 2 characters:

?? – Empty slot
Wr – Warning
Al – Non-shutdown alarm
SD – Shutdown alarm
Last 2 Characters:
Sn – Sensor failure
Hi – Tripped by being greater than threshold
Lo – Tripped by being less than threshold
– (blank) Internal alarm or warning

> Power <

```
Real Pwr        0 kW
React Pwr       0 kVAR
Appar Pwr       0 kVA
Pwr Fact     1.00 PF
```

This is a typical System Power page.

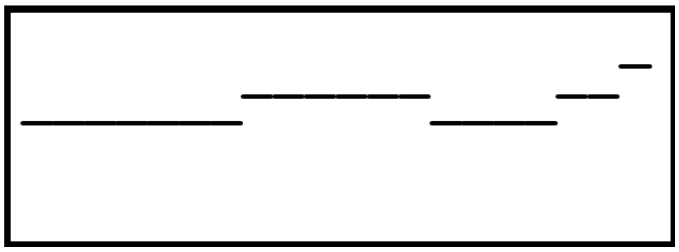
LINE 1: Total system real power in kW.

LINE 2: Total system reactive power in kVAR.

LINE 3: Total system apparent power in kVA.

LINE 4: Total system power factor.

> Graph Hz <



This is the Generator Frequency Graph page. This graph provides a coarse representation of the generator frequency. The graph scrolls from right to left at 2 characters per second (last 10 seconds of data on the display). The bottom of the graph is 50 Hz and the top is 70 Hz. There are 32 levels between bottom and top. Therefore, each level is approximately 0.6 Hz.

> Other <

```
RESERVED FOR
FUTURE USE
```

This is the Other page. At this time, it has no function and serves as a place holder.

◆ RIGHT DISPLAY PAGES

The right display is menu based with eight main menu items: System Alarm and Warning pages, Engine Parameter pages, System Status pages, Maintenance Status Pages, Left Display Menu page, Generator Parameter pages, System Diagnostic pages, and Internal Exercise and HTS pages. To select a page for the right display, do the following:

Press the "MENU" button:

```
Alarms   Left Display
Engine   Generator
Status   Diagnostic
Service  Exercise/HTS
```

Use the arrow keys to move the cursor to the desired menu item and then press the "ENTER" button. Most menu items have multiple pages under them. When that is the case, there is a "More ↔ (x-y)" field at the lower right hand corner of the page where "x" is the page number and "y" is the total number of pages available under this menu item. To move forward or backward through the pages, the cursor is placed on the → or ← character using the arrow buttons and the "ENTER" button is pressed. When a page is first displayed, the cursor normally starts on the → character to promote ease of scanning through the pages.

◆ ALARMS

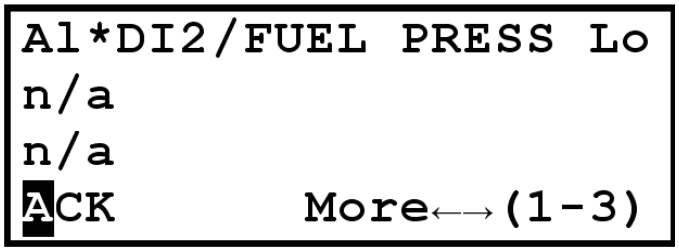
There are three System Alarm and Warning pages. Each page is capable of displaying three alarms or warnings. If there are more than nine total alarms and warnings to list, then only the most recent nine will be visible. All alarms and warnings remain in the list until they are cleared. Warnings clear when they are no longer active. Normal Alarms clear when they are no longer active and have been acknowledged. Shutdown alarms clear only after the key switch has been placed in the OFF position and they are no longer active. There are a few shutdown alarms that will only clear after a power cycle of the controller and they are no longer active. Besides using the menu to get to the alarm pages, the right display immediately changes to the first alarm page when an alarm or warning first becomes active. If a shutdown alarm is active and an alarm or warning is not acknowledged, the displays will flash with the Alarm LED.

Do the following to view the alarm/warnings pages:

Press the "MENU" button.

```
Alarms   Left Display
Engine   Generator
Status   Diagnostic
Service  Exercise/HTS
```

Press the “ENTER” button.



This is a typical System Alarm and Warning page. The n/a indicates there is not an alarm or warning to display on that line. As depicted, this display indicates a Fuel Pressure alarm for low pressure. This would be a common alarm for a system that has the gas line turned off. The “Al” indicates it is an alarm. The “*” indicates the alarm has not been acknowledged. The “DI2/FUEL PRESS” message indicates it is a fuel pressure alarm (DI2 was included in the text by the user to indicate it is Digital Input #2). The “Lo” indicates the alarm was tripped because the input value fell below a set threshold.

The message format symbols are explained below:

First 2 characters:

Wr – Warning

Al – Non-shutdown alarm

SD – Shutdown alarm

Third Character:

* – Has not been acknowledged

Last 2 Characters:

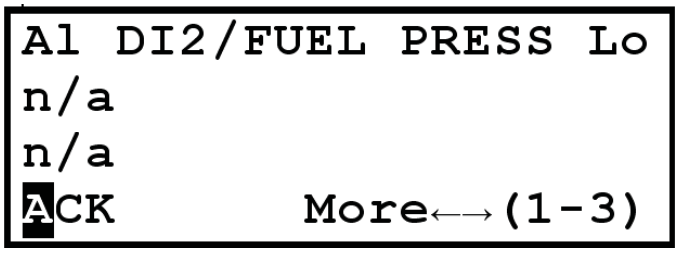
Sn – Sensor failure

Hi – Tripped by being greater than threshold

Lo – Tripped by being less than threshold

(blank) – Internal alarm or warning

Press the “ENTER” button while the cursor is on "ACK" to acknowledge the alarm.



The “*” is now gone since the alarm has been acknowledged.

Turn the gas line on.

The alarm has cleared since the gas pressure is now adequate.

Move the cursor to the ➔ on the bottom line by pressing the ➔ button twice or the ➔ button once.

Press the “ENTER” button to see the next page.

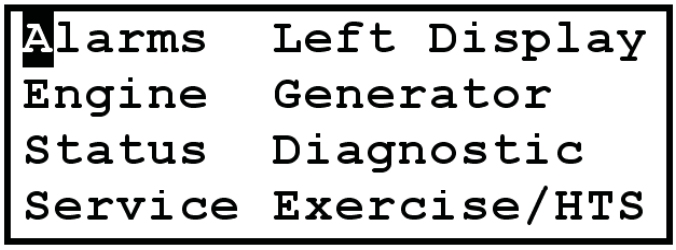
Press the “ENTER” button to see the next page.

ENGINE

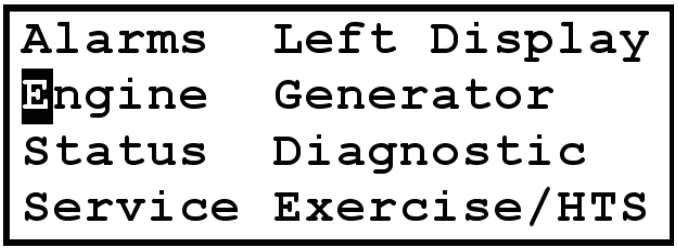
There are four Engine Parameter pages. In most H-100 Control Panels, there are spare analog channels available or unused analog channels. They can be displayed on these pages. If they are not configured, they will not be displayed.

Do the following to view the engine parameter pages:

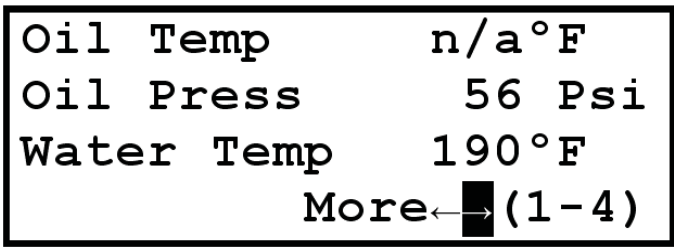
Press the “MENU” button.



Press the ↓ button.



Press the "ENTER" button.



This is a typical first engine parameter page. The three values on this page are not able to be configured as other values.

LINE 1: Oil Temperature (Analog Channel #1) in degrees Fahrenheit.

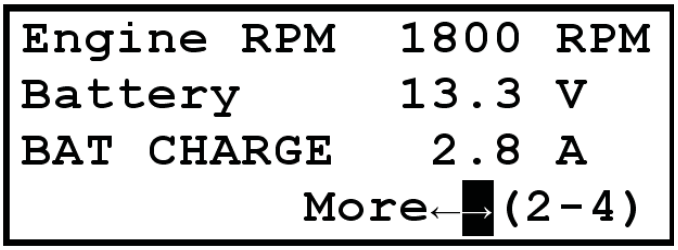
LINE 2: Oil Pressure (Analog Channel #3) in pounds per square inch.

LINE 3: Coolant Temperature (Analog Channel #2) in degrees Fahrenheit.

LINE 4: "More" field to allow page selection.

If any of these signals are not configured, they will display "n/a" for their value such as the Oil Temperature shown above.

Press the "ENTER" button.



This is a typical second engine parameter page. The first two values on this page are not able to be configured as other values.

LINE 1: Engine RPM

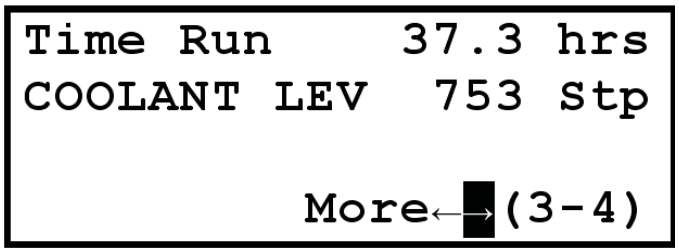
LINE 2: Battery Voltage in Volts DC.

If any of these signals are not configured, they will display "n/a" for their value.

LINE 3: Normally Battery Charger Current (Analog Channel #9). If it is not configured, the line will be blank.

LINE 4: "More" field to allow page selection.

Press the "ENTER" button.



This is a typical third engine parameter page.

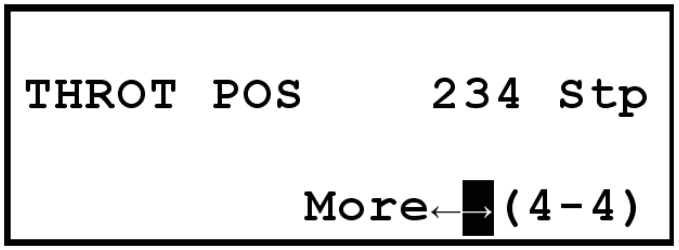
LINE 1: Total number of hours the engine has run.

LINE 2: Coolant Level Sensor (Analog Channel #4) reading in steps 0 - 1023.

LINE 3: Often the Fuel Level Sensor (Analog Channel #5) reading in %. As depicted, Analog Channel #5 is not configured – leaving the line blank.

LINE 4: "More" field to allow page selection.

Press the "ENTER" button.



This is a typical fourth engine parameter page.

LINE 1: Auxiliary Analog Channel input (Analog Channel #6).

LINE 2: Throttle Position Sensor (Analog Channel #7) reading in steps 0 - 1023.

LINE 3: Emissions Sensor (Analog Channel #8) reading. As depicted, Analog Channels #6 and #8 are not configured – leaving the lines blank.

LINE 4: "More" field to allow page selection.

STATUS

There are two System Status pages. These pages show the system status, system time, and system versions.

Do the following to view the system status pages:

Press the “MENU” button.

```
Alarms  Left Display
Engine  Generator
Status  Diagnostic
Service Exercise/HTS
```

Press the ↓ button twice.

```
Alarms  Left Display
Engine  Generator
Status  Diagnostic
Service Exercise/HTS
```

Press the “ENTER” button.

```
Stopped, Key SW Off
Stopped
11:38 Thu 02/09/2006
          More↔(1-2)
```

This is a typical first System Status page.

LINE 1: Engine Running Status. It can have the following values:

“Stopped, Key SW Off”

The engine is stopped and the key switch is in the OFF position.

“Running from Manual”

The engine is starting or running and the key switch is in the MANUAL position.

“Running from 2-wire”

The engine is starting or running because the 2-wire start signal was activated and the key switch is in the AUTO position.

“Running from serial”

The engine is starting or running because the GenLink commanded it to start and the key switch is in the AUTO position.

“Running exercise”

The engine is starting or running because internal exercise was activated and the key switch is in the AUTO position.

“Stopped, Key SW Auto”

The engine is stopped and the key switch is in the AUTO position.

“Running, QuietTest”

The engine is starting or running because QuietTest® was activated and the key switch is in the AUTO position.

“Running, HTS Xfer SW”

The engine is starting or running because the HTS(s) indicated a need for the generator power and the key switch is in the AUTO position.

LINE 2: Generator Status. It can have the following values:

“Resetting”

The generator control system is resetting.

“Stopped”

Generator is stopped and not preheating.

“Stopped, Preheating “

Generator is stopped and preheating.

“Cranking”

Generator is starting and not preheating.

“Cranking, Preheating”

Generator is starting and preheating.

“Pause between starts”

Generator is pausing between consecutive start attempts.

“Started,not to speed”

Generator is started, but has not attained normal running speed yet.

“Warming, Alarms Off “

Generator is started and is up to speed, but is waiting for warmup timer to expire.

“Warmed Up,Alarms Off”

Generator is started and warmed up, but the hold-off alarms are not yet enabled.

“Warming, Alarms On”

Generator is started and the hold-off alarms are enabled, but is waiting for warmup timer to expire.

"Warmed Up, Alarms On"

Generator is started, warmed up, and the hold-off alarms are enabled.

"Running,cooling down"

Generator is still running, but waiting for cool down timer to expire.

"Stopping"

Generator is running down after being turned off normally.

"Stopping due to Alrm"

Generator is running down after being turned off due to a shutdown alarm.

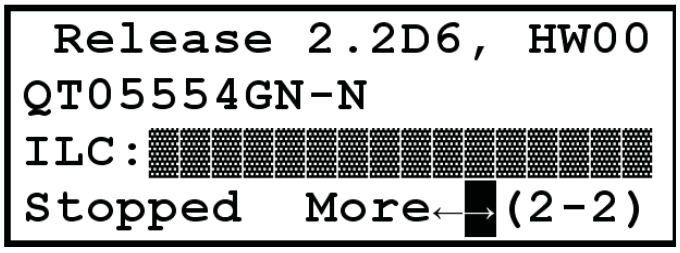
"Stopped due to Alarm"

Generator is stopped due to a shutdown alarm.

LINE 3: System Time and Date. It is able to be changed on this page by using the arrow buttons to go from field to field or to modify a field in edit mode and the "ENTER" button to enter and exit edit mode. There are five editable fields: Hours, Minutes, Month, Day, and Year. The day of the week will change as the displayed date is changed. See the "SET DATE AND TIME" section of this manual for details.

LINE 4: "More" field to allow page selection.

Press the "ENTER" button.



This is a typical second System Status page.

LINE 1: Firmware and Hardware release versions.

LINE 2: Configuration File identifier – serial number, model number, or text.

LINE 3: ILC program name. This text string is blank or blocks (as shown above) when there is no ILC program loaded.

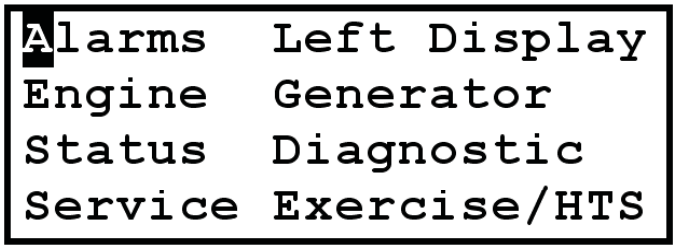
LINE 4: ILC program running status followed by the "More" field to allow page selection.

SERVICE

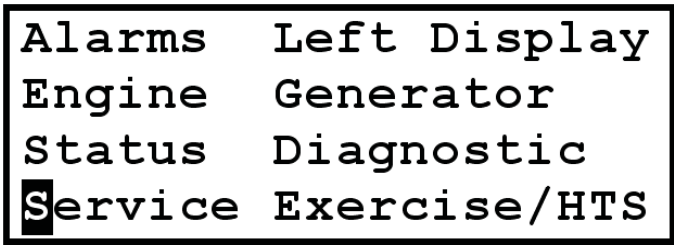
There are four Maintenance Status pages. The first three pages show the status of the scheduled maintenance items. The fourth page allows changing of the display contrast.

Do the following to view the service pages:

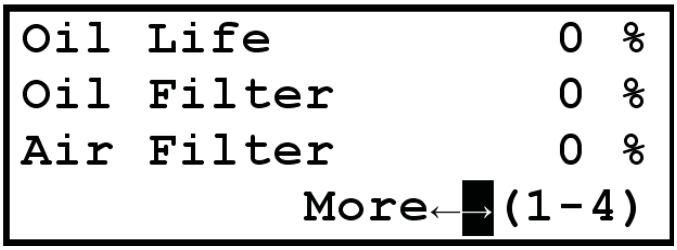
Press the "MENU" button.



Press the ↓ button three times or the ↑ button once.

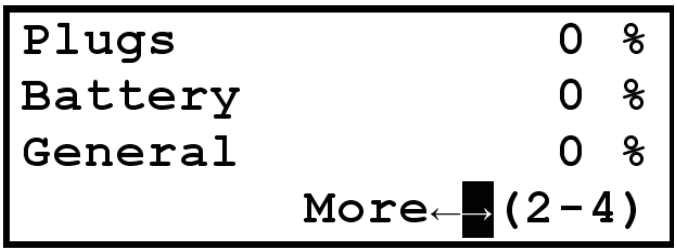


Press the "ENTER" button.



This is a typical first Maintenance Status page. Each line displays a maintenance item that has been set up via GenLink. The value displayed is the approximate % of life remaining before maintenance should be performed. Refer to the Maintenance setup using GenLink.

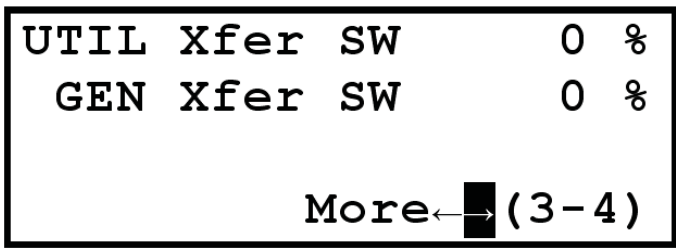
Press the "ENTER" button.



This is a typical second Maintenance Status page.

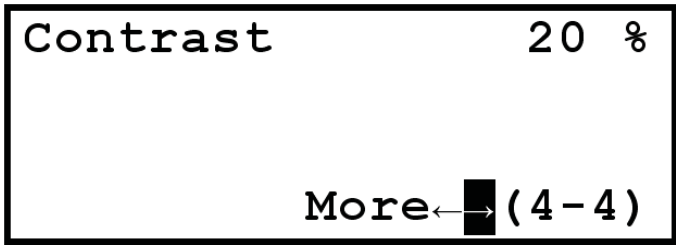
Each line displays a maintenance item that has been set up via GenLink. The value displayed is the approximate % of life remaining before maintenance should be performed. Refer to the Maintenance setup using GenLink.

Press the “ENTER” button.



This is a typical third Maintenance Status page. Each line displays a maintenance item that has been set up via GenLink. The value displayed is the approximate % of life remaining before maintenance should be performed. Refer to the Maintenance setup using GenLink.

Press the “ENTER” button.



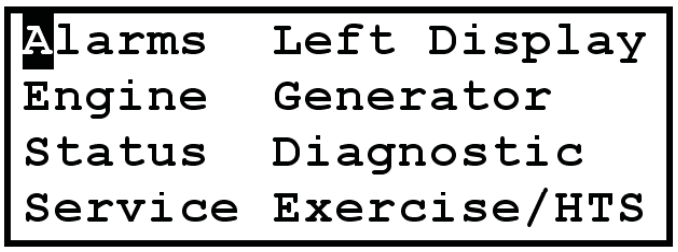
This is a typical fourth Maintenance Status page. The first line is the display contrast. The display contrast is able to be changed on this page. However, changing this setting can result in the display becoming non-readable. Use caution. Use the arrow buttons to go to the contrast field. Press the “ENTER” button to enter edit mode. Use the arrow buttons to change the contrast value (range is 00 to 37). Pressing the “HOME” button while in edit mode will return the value to the last entered value. Press the “ENTER” button to exit edit mode.

GENERATOR

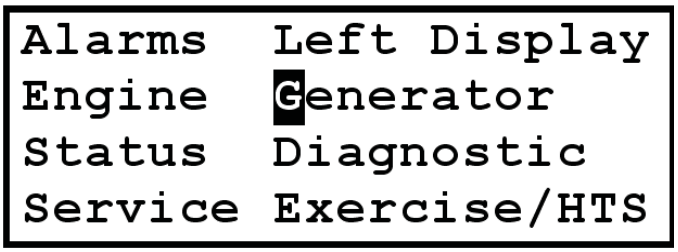
There are three Generator Parameter pages – voltage parameters, power parameters, and i2t parameters.

Do the following to view the generator parameter pages:

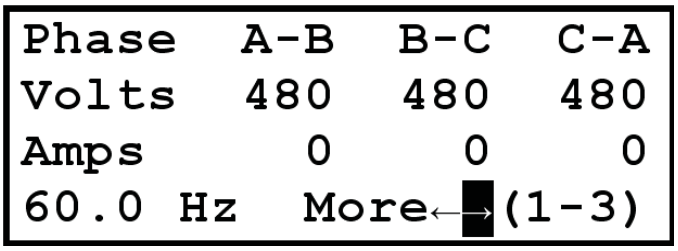
Press the “MENU” button.



Press the ↓ button and then the → button.



Press the “ENTER” button.



This is a typical first Generator Parameter page for a three phase system.

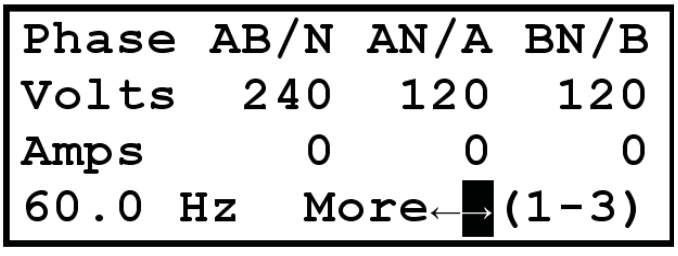
LINE 1: Phase titles for the voltage and current.

LINE 2: Line-to-Line voltages in Volts RMS.

LINE 3: Line currents in Amps RMS.

LINE 4: Generator frequency in Hz followed by the “More” field to allow page selection.

The voltages can be converted to values representing the line-to-neutral voltages by changing the title line (first line) using edit mode. Use the arrow buttons to move to one of the title fields – A-B, B-C, or C-A. Press the “ENTER” button to enter edit mode. Use the up or down arrow button to change the display to A-N, B-N, and C-N. Press the “ENTER” button to exit edit mode. The same process is followed to return to line-to-line displays. This also affects the left display voltage page.



This is a typical first Generator Parameter page for a single phase system.

LINE 1: Phase titles for the voltage and current – voltage title/current title.

LINE 2: Line-to-Line voltage for AB and Line-to-Neutral voltage for A and B in Volts RMS.

LINE 3: Neutral current and Line currents in Amps RMS.

LINE 4: Generator frequency in Hz followed by the "More" field to allow page selection.

Press the "ENTER" button.

```
Power                0 kW
PwrFact           1.00 PF
% Rated Pwr          0 %
            More←→(2-3)
```

This is a typical second Generator Parameter page for a three phase system.

LINE 1: Total system real power in kW.

LINE 2: Total system power factor.

LINE 3: Percentage of the system rated power being used.

LINE 4: The "More" field to allow page selection.

```
Phs   Tot    A-N    B-N
kW      0      0      0
PF   1.00   1.00   1.00
            More←→(2-3)
```

This is a typical second Generator Parameter page for a single phase system.

LINE 1: Phase titles for the power and power factor – Total, A-Neutral, B-Neutral.

LINE 2: Real power in kW – Total system, A-Neutral, B-Neutral.

LINE 3: Power Factor – Total system, A-Neutral, B-Neutral.

LINE 4: The "More" field to allow page selection.

Press the "ENTER" button.

```
i2t Limits
 % Temp >■■■■■          <

            More←→(3-3)
```

This is a typical third Generator Parameters page. It graphically displays the percent of i^2t thermal limit currently attained. If the limit is exceeded, an alarm will be set and the generator will shutdown to protect the alternator. This display will then show % Temp >Over Limit<". GenLink can provide more information regarding actual limits exceeded. This page is disabled if the i^2t function is disabled.

DIAGNOSTICS

There are six System Diagnostic pages. They are digital inputs page, digital outputs page, two analog input pages, RS-232 communications status page, and RS-485 communications status page.

Do the following to view the diagnostics pages:

Press the "MENU" button.

```
Alarms   Left Display
Engine   Generator
Status   Diagnostic
Service  Exercise/HTS
```

Press the ↓ button twice and the → button.

```
Alarms   Left Display
Engine   Generator
Status   Diagnostic
Service  Exercise/HTS
```

Press the "ENTER" button.

```
          Inputs
1  2  3  4  5  6  7  8  9  10
0  0  0  0  0  0  1  0  0  0
            More←→(1-6)
```

This is a typical first System Diagnostics page. It displays ten of the discrete inputs into the H-100 Control Panel. Inputs to the controller are internally pulled to 5 v, so to activate an input you must short it to ground.The following names are normally assigned to these inputs:

#1 Key switch in AUTO position
#2 Key switch in MANUAL position
#3 Emergency Stop Active
#4 Remote 2-wire start Active
#5 Battery Charger Failure
#6 Rupture Basin or Low Fuel Pressure
#7 Transfer Switch in Line Power Position
#8 Transfer Switch in Emergency Power Position
#9 Modem is connecting or connected
#10 Modem is present

Press the “ENTER” button.

```
        Outputs
1 2 3 4 5 6 7 8 9 12
0 0 0 0 0 0 0 0 0 0
          More←→(2-6)
```

This is a typical second System Diagnostics page. It displays ten of the discrete outputs out of the H-100 Control Panel. Outputs from the controller are generally open collector. This means that they sink current through a load and you will NOT see any voltage change on them when they are activated, unless they are connected to a load. These outputs can be temporarily inverted from this page. Extreme caution should be exercised while inverting outputs since it can result in operation of starters, fuel solenoids, etc. To invert an output, use the arrow buttons to position the cursor on the output value to be inverted. Press the “ENTER” button. The output will be inverted for approximately 2 seconds and then return to normal control. Only one output can be inverted at a time and leaving the page cancels all output inversions.

The following names are normally assigned to these outputs:

#1 Key switch in AUTO position
#1 Activate Starter Relay
#2 Activate Fuel Relay
#3 Activate Alarm/Warning Relay (Buzzer)
#4 Activate Gas Relay on 13.3L Engines
#5 Auxiliary Discrete Output #1
#6 Auxiliary Discrete Output #2
#7 Auxiliary Discrete Output #3
#8 Auxiliary Discrete Output #4
#9 Activate Ignition Module on 13.3L Engines
#12 Activate Emissions Module or Preheat

Press the “ENTER” button.

```
        Analogs
1-3     1     2     0
4-6    37   424   467
  7     2 More←→(3-6)
```

Press the “ENTER” button.

```
 8-10   235    13   372
11-13   793     2   249
14-16     2   192   453
          More←→(4-6)
```

The above two pages are typical System Diagnostics Analog Input pages. The analog channel values that are displayed are the “raw” unprocessed data and are 10 bit numbers ranging from 0 - 1023 representing a voltage or current on the analog input channel. The following names are normally assigned to these inputs:

PAGE 3-6 LINE 2:

#1 A current (CT1)
#2 B current (CT2)
#3 C current (only three phase) (CT3)

PAGE 3-6 LINE 3:

#4 A-B voltage (A-N if single phase) (Vsense1)
#5 B-C voltage (B-N if single phase) (Vsense2)
#6 C-A voltage (only three phase) (Vsense3)

PAGE 3-6 LINE 4:

#7 Oil Temperature (AN1)

PAGE 4-6 LINE 1:

#8 Coolant Temperature (AN2)
#9 Oil Pressure (AN3)
#10 Coolant Level (AN4)

PAGE 4-6 LINE 2:

#11 Fuel level (AN5)
#12 Auxiliary Analog Input (AN6)
#13 Throttle Position Sensor (AN7)

PAGE 4-6 LINE 3:

#14 Emissions Oxygen Sensor (AN8)
#15 Battery Charger Current (AN9)
#16 Battery Voltage

Press the "ENTER" button.

```
Mdbus Slv:100/RS-232
9600/8/1/None
Port 1 Statistics
T- R- E- More←→(5-6)
```

Press the "ENTER" button.

```
Mbus Mstr/RS-485
4800/8/2/None
Port 2 Statistics
T* R- E- More←→(6-6)
```

The above two pages are typical of communications diagnostics, one page for each port. The LCD display will show four lines of information about the port:

LINE 1: Will show the type of port protocol that has been selected. It will also show the Modbus address (if appropriate) and whether the port is RS-232 or RS-485.

LINE 2: Will show the settings for the port such as baud rate, bits per character, stop bits, and parity.

LINE 3: Shows a live update of counts of messages transmitted, received, and errors.

LINE 4: Shows a mimic of LED's for TX, RX, and ERR. For example, the TX LED lit (T*) means the H-100 Control Panel is transmitting. Not lit (T-) means it is not transmitting.

EXERCISE/HTS

There are four pages under this menu item – two for internal exercise and two for HTS. This is where the internal exercise can be setup and enabled (see the Exercise Setup Using Front Panel section) and the HTSs can be enabled and monitored.

Do the following to view the internal exercise and HTS pages:

Press the "MENU" button.

```
Alarms   Left Display
Engine   Generator
Status   Diagnostic
Service  Exercise/HTS
```

Press the ← button.

```
Alarms   Left Display
Engine   Generator
Status   Diagnostic
Service  Exercise/HTS
```

Press the "ENTER" button.

```
Y Exercise Enabled
Time Start Wed 10:00
Time Remaining   :00
          More←→(1-4)
```

This is a typical first Internal Exercise and HTS page.

LINE 1: Indicates if internal exercise is enabled. This field is editable.

LINE 2: Day of week and time of day to start the exercise weekly. These fields are editable.

LINE 3: How much time remains before exercise is completed. It starts with 20 minutes.

LINE 4: The "More" field to allow page selection.

Press the "ENTER" button.

```
Y QuietTest Selected
N Start Exercise Now
N Xfer On Exercise
          More←→(2-4)
```

This is a typical second Internal Exercise and HTS page.

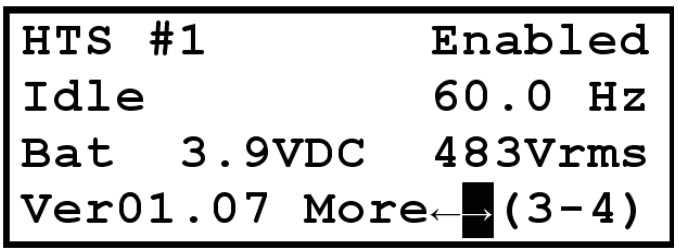
LINE 1: Indicates if QuietTest® is enabled. This field is editable.

LINE 2: Can be used to start a 20 minute exercise period right now. This field is editable.

LINE 3: Indicates if the HTS switches should be exercised during normal exercise mode. This field is editable.

LINE 4: The "More" field to allow page selection.

Press the "ENTER" button.



This is a typical third Internal Exercise and HTS page.

LINE 1: The left side shows the HTS switch number that the data on this page applies to. This field is editable in that switch numbers 1 – 4 can be selected. The Switch number selected on this page also selects the switch to use for the Left Display Switch Mimic diagram if that switch is enabled. In addition, it is the selected switch number for the next page, and for the remote annunciator lights for generator power and line power. The right side of the first line is the mode that the HTS is in. It can have the following values:

"Disabled"

This switch is not present in the system.

"Enabled"

This switch is present in the system and operating normally.

"Fast Test"

The "FAST TEST" button on the HTS has been pressed and fast test is being executed.

"Norm Test"

The "TEST" button on the HTS has been pressed and normal test is being executed.

"No Comms"

This switch is present in the system, but not communicating.

"Xfer Exer"

The system is running in exercise and is exercising the HTS as well.

"Exercise"

The system is running in exercise, but is not exercising the HTS.

LINE 2: The left side is the status of the HTS. It can have the following values:

"Idle"

HTS is waiting for conditions to change. No action is being taken.

"Error"

HTS controller has detected an error.

"TDN"

HTS is in Time Delayed Neutral position.

"Synching"

HTS is waiting for Generator and Utility to become synchronized before changing switch position.

"SB4 Xfer"

HTS has activated the "Signal Before Transfer" relay.

"Cls Gen SW"

HTS is closing the Generator side of the switch.

"Cls Util SW"

HTS is closing the Utility side of the switch.

"Opn Gen SW"

HTS is opening the Generator side of the switch.

"Opn Util SW"

HTS is opening the Utility side of the switch.

"No Utl/Coms"

HTS has detected loss of utility and communications with the H-100 Control Panel.

"No Comms"

HTS has detected utility present, but loss of communications with the H-100 Control Panel.

"Pwr Cycled"

HTS has been power cycled and is awaiting reconfiguration commands from H-100 Control Panel.

"SW Disabled"

HTS indicates that it is disabled.

The right side is the Utility frequency from the HTS in Hz.

LINE 3: The HTS backup battery voltage in Volts DC followed by the Utility voltage from the HTS in Volts RMS.

LINE 4: The HTS firmware version number followed by the "More" field to allow page selection.

Press the "ENTER" button.

This is a typical fourth Internal Exercise and HTS page. The left side of the first line shows the HTS switch number that the data on this page applies to. This field is editable in that switch numbers 1 – 4 can be selected. The Switch number selected on this

page also selects the switch to use for the Left Display Switch Mimic diagram if that switch is enabled. In addition, it is the selected switch number for the previous page, and for the remote annunciator lights for generator power and line power. The right side of the first line is the enable state of the HTS. It is editable and can have the following values:

"Disabled"

This HTS switch is not included in the system.

"Enabled"

This HTS switch is included in the system.

NOTE:

Enabling a switch that is not present will result in a switch communications warning after a few seconds and will switch the display to the Alarms page.

HOME

Press the "HOME" button while not editing a field.

```
Oil    56 Psi n/a°F
Water Temp   190°F
Battery     13.3 V
```

This is a typical Home page. The contents of this page along with the contents of the default left display page (Volts) were selected such that all the normally desired data would be available for viewing at once.

LINE 1: Oil Pressure (Analog Channel #3) in pounds per square inch followed by Oil Temperature (Analog Channel #1) in degrees Fahrenheit.

LINE 2: Coolant Temperature (Analog Channel #2) in degrees Fahrenheit.

LINE 3: Battery Voltage in Volts DC.

If any of these signals above are not configured, they will display "n/a" for their value such as the Oil Temperature shown above.

LINE 4: Often the Fuel Level Sensor (Analog Channel #5) reading in percent. As depicted, Analog Channel #5 is not configured – leaving the line blank.

THE CONTROL PANEL

The H-100 Control Panel has some inputs and outputs which have been designated to be connected to a standardized control panel. The format of the control panel will vary from model to model and not all indicators may be present, however the following signals are always available:

ALARM LED	output
COMMON ALARM	output
AUTO/OFF/MAN KEYSWITCH	input
NOT IN AUTO LED	output
EMERGENCY STOP SWITCH	input

The alarm LED will flash every second if a new alarm occurs. Once this alarm is acknowledged via the touch pad or GenLink, the LED will remain lit until the alarm condition goes away. The LED will flash at least once every 30 seconds to indicate the controller is working properly.

The audible alarm will sound when a new alarm occurs. It will be silenced when it is acknowledged.

The keyswitch in AUTO position allows the system to start automatically, in OFF position prevents the system from operating, and in MANUAL position runs the generator for test purposes only.

The "NOT IN AUTO" LED will flash every second if the keyswitch is not in the AUTO position.

The EMERGENCY STOP switch will stop the generator and post an alarm.

THE ALARM LOG

The alarm log is a permanent (non volatile) store of the last 20 alarms that occurred. If power is removed from the controller, the log will be retained. When the alarm log is full and a new alarm occurs, the oldest alarm will be removed to create space for the new one.

Each alarm is recorded along with a time/date stamp and up to 6 optional measurements. Two of the six measurements are fixed (via password protection) to be coolant temperature and oil pressure.

The measurements you want to record are selected from a pull down list in GenLink using the alarm/event log menu, they can be analog inputs, digital inputs or output functions. For example you can record the generator voltages, frequency and the state of the transfer switch when an alarm occurs. The alarm log can be viewed via GenLink or the left hand front panel display. Alarms are displayed by GenLink in chronological order, the most recent being at the top of the list.

All alarms/warnings and sensor failures are recorded in the alarm log.

THE EVENT LOG

The event log is similar to the alarm log except that the data is stored in temporary memory (volatile) and will be lost if power is removed. The event log has space to hold up to 20 events. When the event log is full and a new event occurs, the oldest event will be removed to create space for the new one.

The event log, as its name implies, is designed to store events which are programmable from GenLink. Each measurement channel or output function can be set as an event along with a setpoint. For example, if you set Digital Input #1 (the keyswitch in AUTO position) as an event with a setpoint of logical one, each time the keyswitch is set in the auto position, an event will be logged. Similarly you can set an analog event with an analog setpoint and a comparison type. For example you can set an event if the oil pressure is less than 10 psi or if power output is greater than 100 kW.

Each event is recorded along with a time/date stamp and up to 6 optional measurements. The measurements you want to record are selected from a pull down list in GenLink using the alarm/event log menu. They can be analog inputs, digital inputs or output functions. The event log can only be displayed via GenLink, it cannot be viewed on the front panel. Events are displayed by GenLink in chronological order, the most recent being at the top of the list.

MAINTENANCE SETTINGS

The controller provides a mechanism to generate multiple warnings based on maintenance intervals. Normally it will be shipped with these warnings turned off. GenLink is used to enable these warnings by setting a maintenance interval for the alarm of choice. The interval can be in engine run hours, a specific engine run hour, number of operations, a specific date or a combination of two of these methods. For example you can set the interval associated with oil life to 6 months or 100 engine hours (whichever occurs first). The transfer switch is one example of where a number of operations is relevant, spark plug life is not.

- To disable a maintenance warning, set the “maintenance cycle” field to N/A.
- To set a specific date, set the “installed at” setting to the current date then set “End of life” to the specific date.
- To set a number of operations, set the “installed at” setting to zero then set “End of life” to the number of operations required.
- To set a specific operation number (say at operation 500), set the “installed at” setting to the current number of operations, then set “End of life” to the operation number.
- To set a number of engine run hours, set the “installed at” setting to zero then set “End of life” to the number of engine hours required.
- NEVER set the “Installed at” hours to anything other than zero.

A warning is generated when the maintenance criteria are met. This warning can be cancelled by the acknowledge button but will re-occur after 15 minutes. To permanently cancel the warning you must reset the maintenance interval. This can only be done via GenLink. The audible alarm will NOT sound for each 15 minute re-occurrence of the warning after the first maintenance warning is acknowledged.

The front panel display will show the percentage of life left for each possible maintenance item.

AIR/FUEL RATIO CONTROL (OPTION)

With the addition of an oxygen sensor and a solenoid to control the air fuel mix, the H-100 Control Panel can perform air/fuel ratio control to provide an optimum (stochiometric) mix to reduce emissions. This feature can be turned on or off via GenLink. The air fuel solenoid output pin shares its function with the preheat output. You must choose one of the two functions as follows:

- To select air/fuel - set the “Diesel y/n” setting on the governor page to “No”. Set preheat to “No”
- To select preheat - set the “Diesel y/n” setting on the governor page to “Y”. Set preheat to “Y”

I^2T CURRENT MONITORING (OPTION)

Optionally the H-100 Control Panel can apply predictive firmware modeling to give I2T protection for the rotor and stator assembly. Based on parameters entered into the H-100 Control Panel via GenLink, the firmware models the temperature rise and fall of the alternator assembly and limits operation to prevent it being damaged. The entered parameters basically describe the thermal properties of each alternator to the firmware. GenLink allows you to choose the alternator model, and this automatically downloads the appropriate parameters. The H-100 Control Panel will normally be delivered preprogrammed with the appropriate data . GenLink will allow you turn this feature on or off as desired. There is a GenLink display of the allowable temperature limits for the selected alternator (2 limits, one for the stator and one for the rotor) and also a display of the predicted temperatures.

INTERNAL EXERCISE FUNCTION

Generators best maintain their readiness by being exercised once per week. This prevents the machine from stagnating and provides an opportunity to discover any maintenance items that may need service before the unit is actually needed for emergency power. In the past, the generator had to be exercised manually or an external exerciser was attached to the generator or transfer switch to activate the remote start once per week for a period of time long enough for the generator to warm up. With the advent of QT series of generators, that function was moved into the generator controller. This allows the QT series generator to have the QuietTest® mode of exercise as one of its key features. Normal mode exercise can be selected instead which can also exercise a Generac Commercial Transfer Switch (HTS) if desired. These features are all standard in the PowerManager® H-100 controller, but require setup by the installer or end user. The internal exercise can be set up using GenLink or by using the front panel displays. This section describes the procedures needed to perform this setup.

The QuietTest® mode and Normal mode of exercise run the generator for approximately 20 minutes starting at a preset day and time once per week when the key switch is in the AUTO position and internal exercise is enabled. If the Normal exercise is used with the option to exercise an HTS selected, the exercise duration may vary based on the HTS settings. QuietTest® cannot exercise the HTS since the lower generator frequency and voltage used to reduce noise levels is incompatible with the standard system loads.

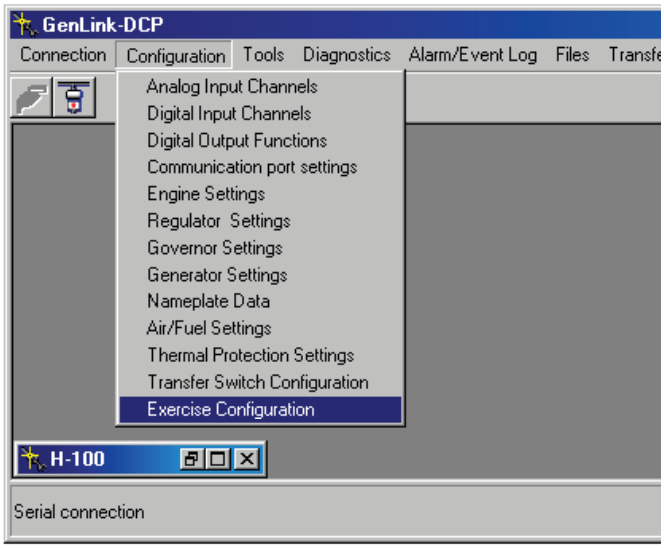
If the generator is needed for emergency power while exercise is running, exercise will be terminated automatically and the system will change to providing emergency power.

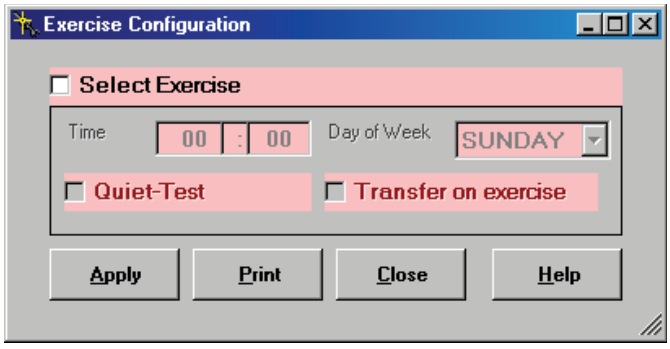
NOTE:

If "transfer on exercise" is selected with an HTS that is not a "Closed Transition Transfer Switch", there will be a momentary (possibly several seconds) interruption in power to the load when switching from Utility to Emergency power and when switching back. For this reason, "transfer on exercise" is normally not selected.

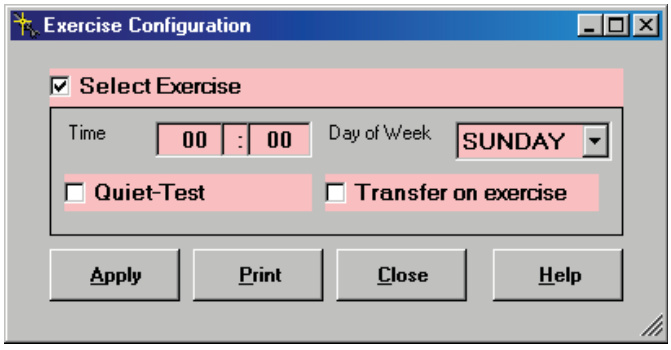
QUIETTEST® SETUP USING GENLINK

Connect to the H-100 control panel. Using the "Configuration" pull down, select "Exercise Configuration" to display the Exercise Configuration screen.

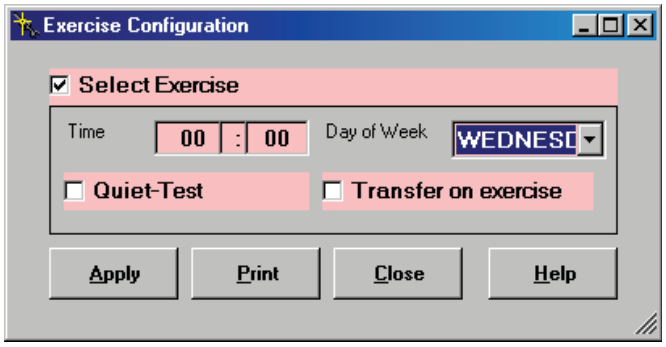




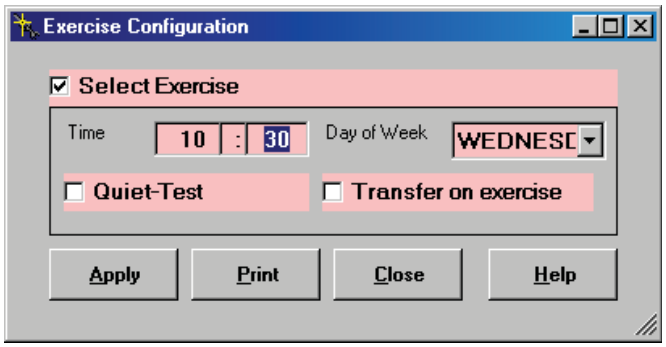
Click on "Select Exercise" to enable internal exercise and allow the changing of the other exercise parameters.



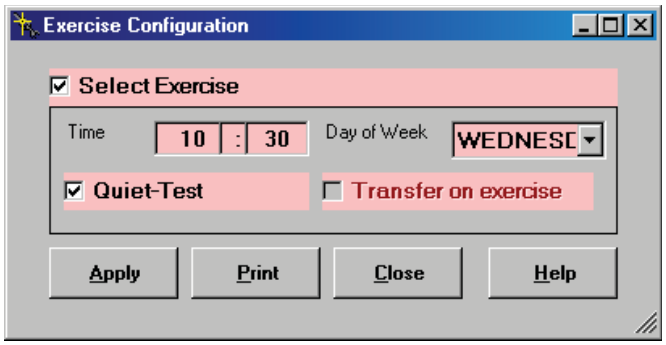
Select the day of week to run the exercise.



Select the time of day to run exercise.



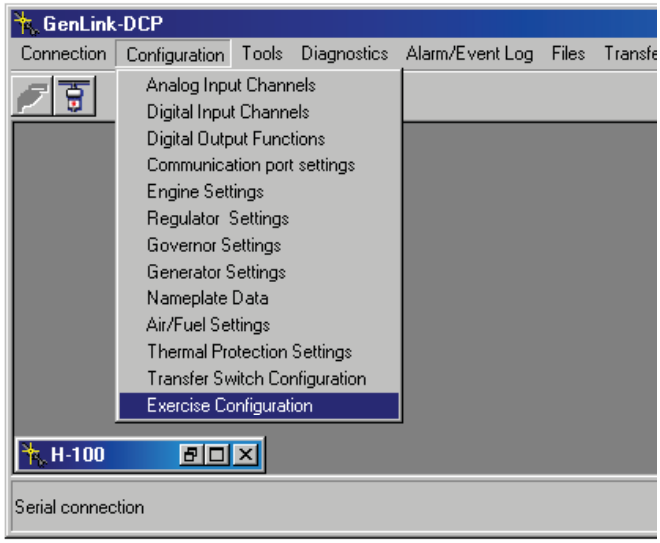
Click on “QuietTest®” to enable the exercise mode with reduced sound levels. Press “Apply”.

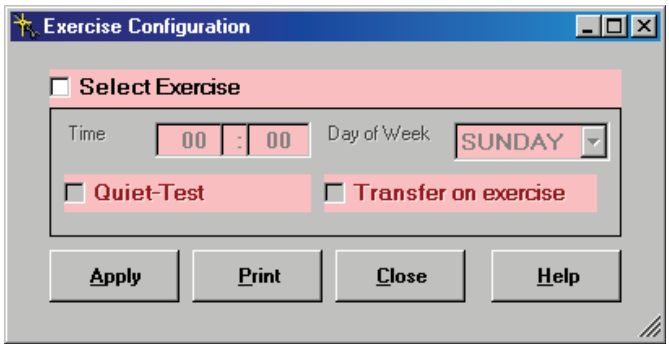


Setup of QuietTest® is now complete. For this example, QuietTest® will start every Wednesday at 10:30 AM and run until about 10:50 AM

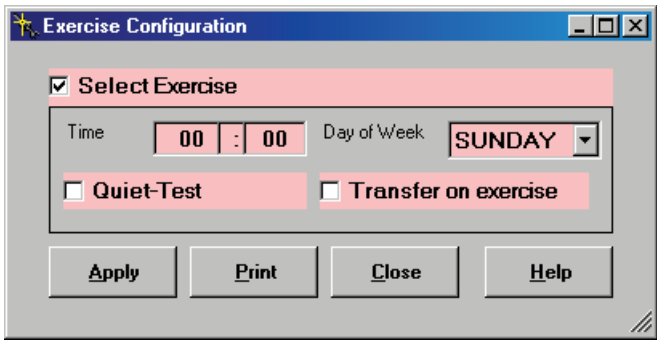
NORMAL EXERCISE SETUP USING GENLINK

Connect to the H-100 control panel. Using the “Configuration” pull down, select “Exercise Configuration” to display the Exercise Configuration screen.

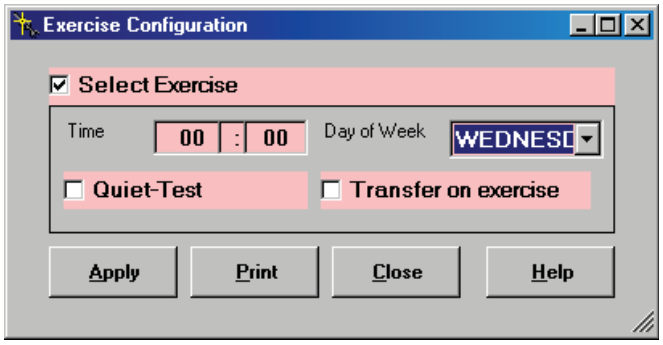




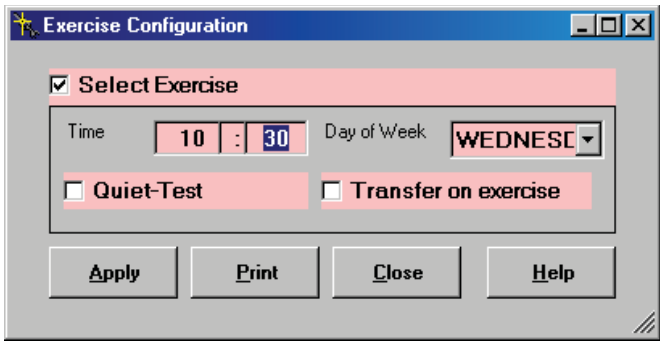
Click on ”Select Exercise” to enable internal exercise and allow the changing of the other exercise parameters.



Select the day of week to run the exercise.



Select the time of day to run exercise.



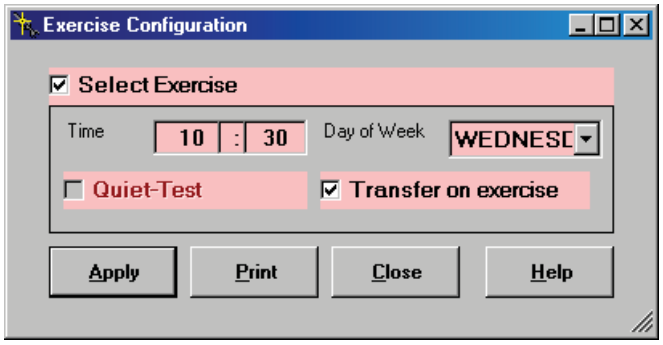
Verify "QuietTest®" is not checked. Press "Apply".

Setup of Normal exercise is now complete. For this example, exercise will start every Wednesday at 10:30 AM and run until about 10:50 AM

If exercise of the HTS is desired, Click on "Transfer on exercise" to enable transferring of the load to the generator during exercise.

NOTE:

This feature is only available in non-QuietTest® exercise and when an HTS is in the system.



QUIETTEST® SETUP USING FRONT PANEL

Press the "MENU" button.

```
Alarms   Left Display
Engine   Generator
Status   Diagnostic
Service  Exercise/HTS
```

Move the cursor using the arrow keys to the Exercise/HTS menu item.

```
Alarms   Left Display
Engine   Generator
Status   Diagnostic
Service  Exercise/HTS
```

Press the "ENTER" button.

```
N Exercise Enabled
Time Start Sun 00:00
Time Remaining   :00
          More←→(1-4)
```

Move the cursor to the "Exercise Enabled" field on the first line.

```
N Exercise Enabled
Time Start Sun 00:00
Time Remaining   :00
          More←→(1-4)
```

Press the "ENTER" button to enter edit mode.

```
N Exercise Enabled
Time Start Sun 00:00
Time Remaining   :00
          More←→(1-4)
```

Use the up and down arrow keys until a “Y” appears in the field.

```
Y Exercise Enabled
Time Start Sun 00:00
Time Remaining   :00
          More←→(1-4)
```

Press the “ENTER” button to exit edit mode.

```
Y Exercise Enabled
Time Start Sun 00:00
Time Remaining   :00
          More←→(1-4)
```

Move the cursor to the “Time Start” day of week field on the second line.

```
Y Exercise Enabled
Time Start Sun 00:00
Time Remaining   :00
          More←→(1-4)
```

Press the “ENTER” button to enter edit mode.

```
Y Exercise Enabled
Time Start Sun 00:00
Time Remaining   :00
          More←→(1-4)
```

Use the up and down arrow key until the desired day of the week is displayed.

```
Y Exercise Enabled
Time Start Wed 00:00
Time Remaining   :00
          More←→(1-4)
```

Press the "ENTER" button to exit edit mode.

```
Y Exercise Enabled
Time Start Wed 00:00
Time Remaining   :00
          More←→(1-4)
```

Move the cursor to the “Time Start” time of day hours field on the second line.

```
Y Exercise Enabled
Time Start Wed 00:00
Time Remaining   :00
          More←→(1-4)
```

Press the “ENTER” button to enter edit mode.

```
Y Exercise Enabled
Time Start Wed 00:00
Time Remaining   :00
          More←→(1-4)
```

Use the up and down arrow key until the desired hour of the day is displayed.

NOTE:

In a number field the up/down arrows move the digit up and down while the left/right arrows move to the adjacent digit.

```
Y Exercise Enabled
Time Start Wed 10:00
Time Remaining   :00
          More←→(1-4)
```

Press the “ENTER” button to exit edit mode.

```
Y Exercise Enabled
Time Start Wed 10:00
Time Remaining   :00
          More←→(1-4)
```

Move the cursor to the “Time Start” time of day minutes field on the second line.

```
Y Exercise Enabled
Time Start Wed 10:00
Time Remaining   :00
          More←→(1-4)
```

Press the “ENTER” button to enter edit mode.

```
Y Exercise Enabled
Time Start Wed 10:00
Time Remaining   :00
          More←→(1-4)
```

Use the up and down arrow key until the desired minute of the hour is displayed.

```
Y Exercise Enabled
Time Start Wed 10:30
Time Remaining   :00
          More←→(1-4)
```

Press the “ENTER” button to exit edit mode.

```
Y Exercise Enabled
Time Start Wed 10:30
Time Remaining   :00
          More←→(1-4)
```

Move the cursor to the ➔on the bottom line.

```
Y Exercise Enabled
Time Start Wed 10:30
Time Remaining   :00
          More←→(1-4)
```

Press the “ENTER” button to move to the second page.

```
N QuietTest Selected
N Start Exercise Now
N Xfer On Exercise
          More←→(2-4)
```

Move the cursor to the “QuietTest Selected” field on the first line.

```
N QuietTest Selected
N Start Exercise Now
N Xfer On Exercise
          More←→(2-4)
```

Press the “ENTER” button to enter edit mode.

```
N QuietTest Selected
N Start Exercise Now
N Xfer On Exercise
          More←→(2-4)
```

Use the up and down arrow key until a “Y” appears.

```
Y QuietTest Selected
N Start Exercise Now
N Xfer On Exercise
          More←→(2-4)
```

Press the “ENTER” button to exit edit mode.

```
Y QuietTest Selected
N Start Exercise Now
N Xfer On Exercise
          More←→(2-4)
```

NOTE:

Verify that “Xfer On Exercise” field is an “N”. Otherwise, QuietTest® will be overridden with normal exercise.

Setup of QuietTest® is now complete. For this example, QuietTest® will start every Wednesday at 10:30 AM and run until about 10:50 AM

While QuietTest® is running, the "Time Remaining" will display the approximate number of minutes left before QuietTest® is completed.

```
Y Exercise Enabled
Time Start Wed 10:30
Time Remaining   :20
          More←→(1-4)
```

NORMAL EXERCISE SETUP USING FRONT PANEL

Press the "MENU" button.

```
Alarms  Left Display
Engine  Generator
Status  Diagnostic
Service Exercise/HTS
```

Move the cursor using the arrow keys to the Exercise/HTS menu item.

```
Alarms  Left Display
Engine  Generator
Status  Diagnostic
Service Exercise/HTS
```

Press the "ENTER" button.

```
N Exercise Enabled
Time Start Sun 00:00
Time Remaining   :00
          More←→(1-4)
```

Move the cursor to the "Exercise Enabled" field on the first line.

```
N Exercise Enabled
Time Start Sun 00:00
Time Remaining   :00
          More←→(1-4)
```

Press the "ENTER" button to enter edit mode.

```
N Exercise Enabled
Time Start Sun 00:00
Time Remaining   :00
          More←→(1-4)
```

Use the up and down arrow keys until a "Y" appears in the field.

```
Y Exercise Enabled
Time Start Sun 00:00
Time Remaining   :00
          More←→(1-4)
```

Press the "ENTER" button to exit edit mode.

```
Y Exercise Enabled
Time Start Sun 00:00
Time Remaining   :00
          More←→(1-4)
```

Move the cursor to the "Time Start" day of week field on the second line.

```
Y Exercise Enabled
Time Start Sun 00:00
Time Remaining   :00
          More←→(1-4)
```

Press the "ENTER" button to enter edit mode.

```
Y Exercise Enabled
Time Start Sun 00:00
Time Remaining   :00
          More←→(1-4)
```

Use the up and down arrow key until the desired day of the week is displayed.

```
Y Exercise Enabled
Time Start Wed 00:00
Time Remaining   :00
          More←→(1-4)
```

Press the "ENTER" button to exit edit mode.

```
Y Exercise Enabled
Time Start Wed 00:00
Time Remaining   :00
          More←→(1-4)
```

Move the cursor to the “Time Start” time of day hours field on the second line.

```
Y Exercise Enabled
Time Start Wed 00:00
Time Remaining   :00
          More←→(1-4)
```

Press the “ENTER” button to enter edit mode.

```
Y Exercise Enabled
Time Start Wed 00:00
Time Remaining   :00
          More←→(1-4)
```

Use the up and down arrow key until the desired hour of the day is displayed.

NOTE:

In a number field the up/down arrows move the digit up and down while the left/right arrows move to the adjacent digit.

```
Y Exercise Enabled
Time Start Wed 10:00
Time Remaining   :00
          More←→(1-4)
```

Press the “ENTER” button to exit edit mode.

```
Y Exercise Enabled
Time Start Wed 10:00
Time Remaining   :00
          More←→(1-4)
```

Move the cursor to the “Time Start” time of day minutes field on the second line.

```
Y Exercise Enabled
Time Start Wed 10:00
Time Remaining   :00
          More←→(1-4)
```

Press the “ENTER” button to enter edit mode.

```
Y Exercise Enabled
Time Start Wed 10:00
Time Remaining   :00
          More←→(1-4)
```

Use the up and down arrow key until the desired minute of the hour is displayed.

```
Y Exercise Enabled
Time Start Wed 10:30
Time Remaining   :00
          More←→(1-4)
```

Press the “ENTER” button to exit edit mode.

```
Y Exercise Enabled
Time Start Wed 10:30
Time Remaining   :00
          More←→(1-4)
```

Move the cursor to the ➔on the bottom line.

```
Y Exercise Enabled
Time Start Wed 10:30
Time Remaining   :00
          More←→(1-4)
```

Press the “ENTER” button to move to the second page.

```
Y QuietTest Selected
N Start Exercise Now
N Xfer On Exercise
          More←→(2-4)
```

Move the cursor to the “QuietTest Selected” field on the first line.

```
Y QuietTest Selected
N Start Exercise Now
N Xfer On Exercise
          More←→(2-4)
```

Press the “ENTER” button to enter edit mode.

```
Y QuietTest Selected
N Start Exercise Now
N Xfer On Exercise
          More←→(2-4)
```

Use the up and down arrow key until a “N” appears.

```
N QuietTest Selected
N Start Exercise Now
N Xfer On Exercise
          More←→(2-4)
```

Press the “ENTER” button to exit edit mode.

```
N QuietTest Selected
N Start Exercise Now
N Xfer On Exercise
          More←→(2-4)
```

Setup of Normal Exercise is now complete. For this example, exercise will start every Wednesday at 10:30 AM and run until about 10:50 AM

While normal exercise is running, the “Time Remaining” will display the approximate number of minutes left before exercise is completed.

```
Y Exercise Enabled
Time Start Wed 10:30
Time Remaining   :00
          More←→(1-4)
```

If it is desired to exercise the HTS as well during the exercise cycle, then continue with the enabling of “transfer on exercise” described below.

Move the cursor to the “Xfer On Exercise” field on the third line.

```
Y QuietTest Selected
N Start Exercise Now
N Xfer On Exercise
          More←→(2-4)
```

Press the “ENTER” button to enter edit mode.

```
Y QuietTest Selected
N Start Exercise Now
N Xfer On Exercise
          More←→(2-4)
```

Use the up and down arrow key until a "Y" appears.

```
Y QuietTest Selected
N Start Exercise Now
Y Xfer On Exercise
          More←→(2-4)
```

Press the "ENTER" button to exit edit mode.

```
Y QuietTest Selected
N Start Exercise Now
Y Xfer On Exercise
          More←→(2-4)
```

Setup of Normal Exercise with transfer to load during exercise is now complete. For this example, exercise will start every Wednesday at 10:30 AM and run until about 10:50 AM. However, the HTS settings may change this time.

While normal exercise is running, the "Time Remaining" will display the approximate number of minutes left before exercise is completed.

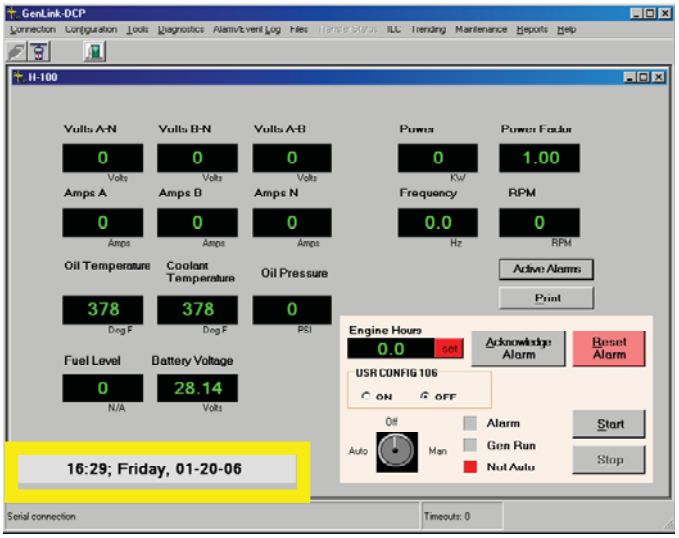
```
Y Exercise Enabled
Time Start Wed 10:30
Time Remaining   :20
          More←→(1-4)
```

SET DATE AND TIME

The H-100 Control Panel contains a real time clock to keep track of date and time. This is used to schedule internal exercise, time stamp alarm/event log entries, and time stamp reports. The date and time can be changed using either GenLink or the front panel display.

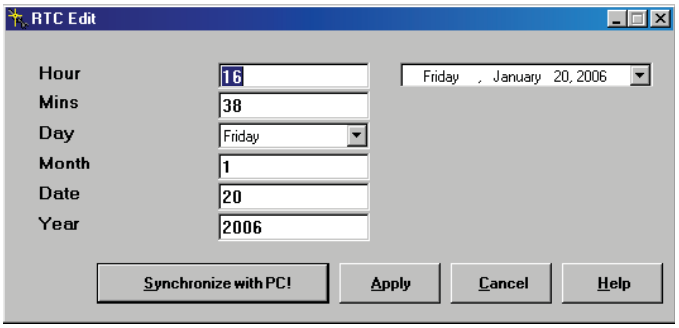
◆ DATE AND TIME SETUP USING GENLINK

Connect to the H-100 control panel.



The date and time field is displayed in the lower left corner of the screen.

Using the mouse cursor, click on the date and time field.



Any of the fields are editable. Note that hours are entered as 0 – 23. If the PC being used has reliable date and time settings, pressing the "Synchronize with PC!" button will copy the PC date and time into the H-100 Control Panel. Otherwise, press "Apply" after making changes. The date and time on the GenLink screen may take a few seconds to update.

◆ DATE AND TIME SETUP USING FRONT PANEL

Press the "MENU" button.

```
Alarms    Left Display
Engine    Generator
Status    Diagnostic
Service   Exercise/HTS
```

Press the ↓ button twice.

```
Alarms  Left Display
Engine  Generator
Status  Diagnostic
Service Exercise/HTS
```

Press the “ENTER” button.

```
Stopped, Key SW Off
Stopped
11:38 Thu 02/09/2006
          More←→(1-2)
```

There are 5 editable fields on line 3. They are hours, minutes, month, day, and year. Use the arrow keys to move to each of the fields needing to be changed. Press enter to begin edit mode. Use the up and down arrow keys to slew to the desired value. Press enter to exit edit mode or use the right or left arrow keys to leave the field. The date and time setup is completed.

ADJUST DISPLAY CONTRAST

The display contrast is adjustable to accommodate different viewing environments. The generator is shipped from the factory with the contrast set to 20%. This is optimal for most situations. However, if the user needs to change the contrast, they can do so by editing the value on the last “Service” page. Note that changing the contrast can make the screen nearly unreadable and the contrast setting is saved across power cycles. Caution should be exercised while editing this value.

Do the following to change the display contrast:

Press the “MENU” button.

```
Alarms  Left Display
Engine  Generator
Status  Diagnostic
Service Exercise/HTS
```

Press the ↓ button button three times or the ↑ button once.

```
Alarms  Left Display
Engine  Generator
Status  Diagnostic
Service Exercise/HTS
```

Press the “ENTER” button.

```
Oil Life          0 %
Oil Filter        0 %
Air Filter        0 %
          More←→(1-4)
```

Press the ← button.

```
Oil Life          0 %
Oil Filter        0 %
Air Filter        0 %
          More←→(1-4)
```

Press the “ENTER” button.

```
Contrast         20 %


          More←→(4-4)
```

Press the ↓ button and then the → button.

```
Contrast         20 %


          More←→(4-4)
```

Press the “ENTER” button to enter edit mode.

Use the arrow buttons to change the contrast value (range is 00 to 37). Pressing the "HOME" button while in edit mode will return the value to the last entered value.

Press the "ENTER" button to exit edit mode.

The contrast is now set and can only be changed by editing the value on this page.

ENABLE GENERAC COMMERCIAL TRANSFER SWITCH (HTS)

The H-100 Control Panel can control up to four HTSs via the RS-485 communications port. The H-100 Control Panel is shipped without the HTS control enabled. If the user has an HTS in their system, they must enable the HTS via GenLink or the front panel. If the HTS is not enabled, the generator will not operate automatically with loss of utility. If the H-100 Control Panel enables a non-existent HTS, there will be a warning indicated.

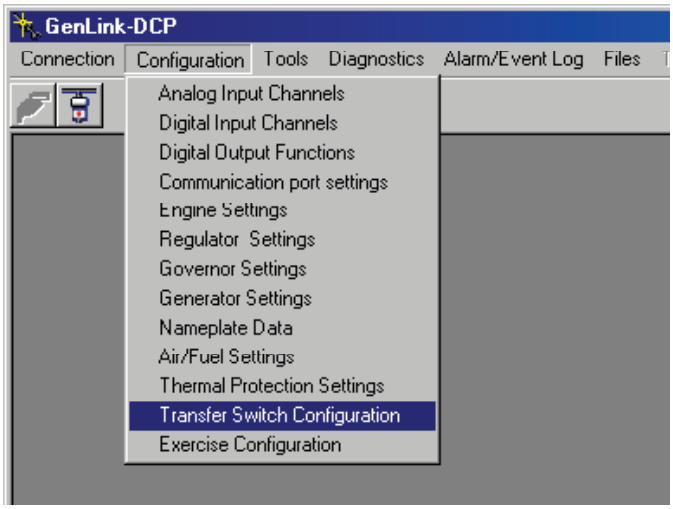
NOTE:

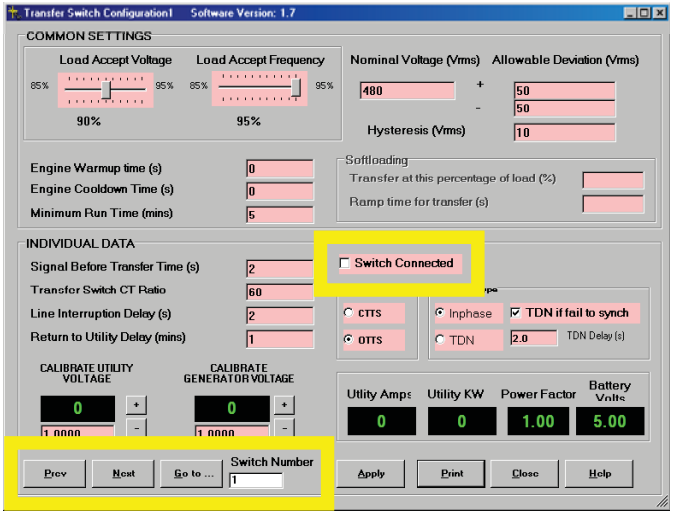
Non-HTS switches use the two-wire start interface and do not need enabling by H-100 Control Panel.

◆ HTS SETUP USING GENLINK

Connect to the H-100 control panel.

Using the "Configuration" pull down, select "Transfer Switch Configuration" to display the HTS Configuration screen.

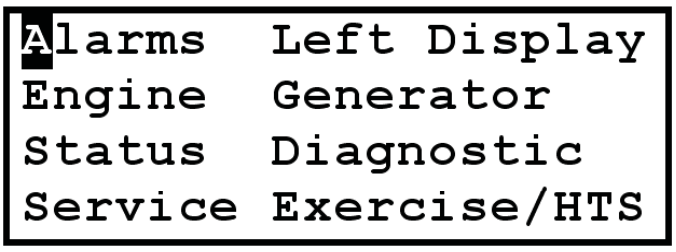




The lower left corner contains the HTS number. Use the "Prev" and "Next" buttons to select the appropriate switch number - 1 through 4. If enabling the switch, check the "Switch Connected" check box in the middle of the screen. If disabling the switch, uncheck the "Switch Connected" check box. The remainder of the settings on this page are described in the HTS manual.

◆ HTS SETUP USING FRONT PANEL

Press the "MENU" button.



Press the ← button.

```
Alarms  Left Display
Engine  Generator
Status  Diagnostic
Service Exercise/HTS
```

Press the "ENTER" button.

```
Y Exercise Enabled
Time Start Wed 10:30
Time Remaining   :00
          More←→(1-4)
```

Press the ← button.

```
Y Exercise Enabled
Time Start Wed 10:00
Time Remaining   :00
          More←→(1-4)
```

Press the "ENTER" button.

```
HTS #1        Disabled


          More←→(4-4)
```

This is the HTS enabling/disabling page. The HTS number needs to be selected first.

Press the → button to go to the HTS # field.

```
HTS #1        Disabled


          More←→(4-4)
```

Press the "ENTER" button to enter the edit mode.

```
HTS #1        Disabled


          More←→(4-4)
```

Select the appropriate HTS number using the up and down arrow buttons.

Press the "ENTER" button to exit the edit mode.

```
HTS #1        Disabled


          More←→(4-4)
```

Press the → button to go to the HTS Enable/Disable field.

```
HTS #1        Disabled


          More←→(4-4)
```

Press the "ENTER" button to enter the edit mode.

```
HTS #1        Disabled


          More←→(4-4)
```

Select the Enabled / Disabled using the up and down arrow buttons.

```
HTS #1        _Enabled


          More←→(4-4)
```

Press the "ENTER" button to exit the edit mode.

For this example, HTS number 1 is now enabled. If HTS #1 is not connected or if the HTS is not #1, there will be a communications error indicated.

COMMUNICATIONS

There are 2 ports on the H-100 Control Panel, an RS-232 port and an RS-485. Each port can be reconfigured as to its function, however there can only be one master Modbus port. All ports can have their baud rate, parity and stop bits changed. For Modbus ports, the address can also be changed via GenLink, but each address in a connected system must be unique. Normally the RS-232 port will be configured as a Modbus slave to communicate with GenLink and the optional Modem. The RS-485 port will act as a master for connection to up to two remote annunciators/remote relay panels and up to four HTSs. The RS-485 port can be reconfigured via GenLink to be a deep diagnostic port.

REMOTE ANNUNCIATOR CONNECTION (OPTION)

The H-100 Control panel RS-485 port is normally configured as Modbus Master, 4800 baud, no parity, and two stop bits. This is the required configuration for the remote annunciator. However, the remote annunciator is often shipped configured as a Modbus Master (active mode). A wire jumper must be added in the remote annunciator to configure it as the Modbus Slave (passive mode). A total of up to two remote annunciators and remote relay panels can be attached to the RS-485 bus. See the remote annunciator/relay panel manual for details.

In an H-100 Control Panel system without HTS switches, the annunciator will indicate Line Power or Generator Power based on two designated H-100 control panel spare inputs Input #7 (Also labeled DI3) and Input #8 (Also labeled DI4). These inputs can be used for other functions as desired, but will always operate the annunciator lights. Input #7 should be connected to Line Power indication. Input #8 should be connected to Generator Power indication.

In an H-100 Control Panel system with HTS switches, the annunciator will indicate Line Power or Generator Power based on the status reported from the selected HTS. The selected HTS is the HTS number that was selected using the H-100 control front panel. The number is selected on either of the Exercise/HTS pages (3-4) or (4-4). The two designated H-100 control panel inputs Input #7 and Input #8 are free to be used for other functions and will not affect the annunciator as long as at least one HTS is connected and enabled.

NEW GENERATION GENLINK (NGG)

An all new version of GenLink has been released for support of the H-100 Control Panel. It uses the industry standard Modbus protocol for communications and acts as a Modbus master. GenLink runs on PC platforms running Windows 98 (but will not support future Internet applications), Windows NT 4.0, Windows 200 and XP. We recommend an Intel Pentium 4 processor (1.0gHz+) with a minimum 64MB memory and 20GB hard drive. plus 56k Zonet PCMCIA based modem. For details about GenLink, refer to the New Generation GenLink manual. Addtional features include:

◆ GENLINK RELAY CONTROL

There is a “Radio Button” displayed on the main GenLink display screen. This button will set or reset output function 106 which in turn can be made to drive a relay or any combination of things (via the ILC). The function can be renamed and this new name will appear above the radio button.

◆ SET ENGINE HOURS

In the event that a controller has to be replaced, the engine hours on the new controller can be set to match the controller it is replacing. This can only be done at the factory.

◆ ABSOLUTE MAXIMUM RATINGS

Supply Voltage rating	5 - 30V dc continuous
Power consumption	0.45A typical

◆ ENVIRONMENTAL RATINGS

Temperature	0 - 50 deg. C
Relative humidity	20 - 95%, non condensing
Sealing	IP65
ESD	As per manufacturer's spec.

APPENDIX A — ANALOG FUNCTIONS

The User Configurable Analog Inputs have several parameters that affect the value interpreted from the A/D reading. In general, the following equation determines the final User Configurable Analog Input result:

Result = Scale (Function (Calibrate (Raw A/D reading)))

For functions that require 4 coefficients for a polynomial, the calibration factor has to be incorporated in the polynomial coefficients. In this case, the following equation determines the final User Configurable Analog Input result:

Result = Scale (Function (Raw A/D reading))

The RMS Analog Inputs have a calibration parameter and a scaling parameter that affect the value interpreted from the A/D reading. The following equation determines the final RMS Analog Input result:

Result = Scale (Calibrate (RMS Function (Raw A/D reading)))

Although the calibration and scaling adjustments exist for the remaining Analog Inputs (i.e. derived channels), it is unlikely they will be used. The remaining Analog Inputs are derived from other analog inputs that have already been adjusted. If further adjustment is needed, then the following equation determines the final Analog Input result:

Result = Scale (Calibrate (RMS Function (Raw A/D reading)))

These derived inputs have more complex interactions with the hardware, so care should be taken if adjustments are used.

The conversion functions are described below. One of these functions is a 16 bit floating point polynomial - GEN_FP_POLY. This function should only be used as an extreme last resort as it is processor time intensive. The other integer polynomial functions should be sufficient for converting the A/D input data.

The coefficients for the conversion functions need to be adjusted for working in the A/D counts realm as opposed to the voltage realm. Multiply A/D reading voltage by 1023/5 to convert to A/D reading counts. Also, the coefficient scaling is in powers of 2 to expedite processing of math operations using shifts instead of multiply and divide. The following types of Analog Input functions are implemented in the firmware.

THERMISTOR:

PRESSURE:

POLY_3RD:

Third order polynomial with 4 coefficients and a scaling factor

X = raw_analog
(AX3 + BX2 + CX + D) * S

Where:

A, B, C, D are polynomial coefficients
S is the scaling factor
Coefficient 3 = A * 10243
Coefficient 2 = B * 10242
Coefficient 1 = C * 1024
Calibration = D
Scaling = S * 1024

POLY_2ND:

Second order polynomial with 3 coefficients, a scaling factor, and a calibration factor

X = M * raw_analog
(AX2 + BX + C) * S

Where:

M is the calibration factor
A, B, C are polynomial coefficients
S is the scaling factor
Calibration = M * 1024
Coefficient 3 = A * 10242
Coefficient 2 = B * 1024
Coefficient 1 = C
Scaling = S * 1024

LINEAR:

POLY_1ST:

First order polynomial with 2 coefficients, a scaling factor, and a calibration factor

X = M * raw_analog
(AX + B) * S

Where:

M is the calibration factor
A, B are polynomial coefficients
S is the scaling factor
Calibration = M * 1024
Coefficient 2 = A * 1024
Coefficient 1 = B
Scaling = S * 1024

POLY_1ST_N1:

First order polynomial with 3 coefficients, a scaling factor, and a calibration factor

X = M * raw_analog
(A + BX + CX-1) * S

Where:

M is the calibration factor
A, B, C are polynomial coefficients
S is the scaling factor
Calibration = M * 1024
Coefficient 3 = C
Coefficient 2 = B * 1024
Coefficient 1 = A
Scaling = S * 1024

POLY_1ST_N2:

First order polynomial with 4 coefficients and a scaling factor

X = raw_analog
(A + BX + CX-1 + DX-2) * S

Where:

A, B, C, D are polynomial coefficients
S is the scaling factor
Coefficient 3 = D
Coefficient 2 = C
Coefficient 1 = B * 1024
Calibration = A
Scaling = S * 1024

CFM_SENSOR:

First order polynomial with 4 coefficients and a scaling factor

X = raw_analog - learned_offset
(A + BX + CX-1 + DX-2) * S

Where:

A, B, C, D are polynomial coefficients
S is the scaling factor
Coefficient 3 = D/32
Coefficient 2 = C
Coefficient 1 = B * 32768
Calibration = A * 64
Scaling = S * 1024

CURRENT:

CAL_SCALE:

Implements a scaling factor and a calibration factor

X = M * raw_analog
X * S

Where:

M is the calibration factor
S is the scaling factor
Calibration = M * 1024
Scaling = S * 1024

GEN_FP_POLY:

Third order polynomial with 4 coefficients

X = raw_analog
AX3 + BX2 + CX + D

Where:

A, B, C, D are 16 bit floating point polynomial coefficients
Coefficient 3 = A
Coefficient 2 = B
Coefficient 1 = C
Calibration = D

Amplitudes from 0.00000005961 (256 E-16) to 1,098,437,885,952 (1023 E+15) are possible with this representation with at least 9 significant bits.

APPENDIX B — H-100 GENERAL I/O AND CONNECTOR INFORMATION

◆ H-100 ANALOG INPUTS

Number	Default Signal Name	Default Signal Name	Type	Connector Pin
1	OIL TEMP	Oil Temperature	4-20 ma	J1-9 source, J1-8 return
2	COOLANT TEMP	Coolant Temperature	4-20 ma	J1-15 source, J1-31 return
3	OIL PRESSURE	Oil Pressure	4-20 ma	J1-20 source, J1-19 return
4	COOLANT LEVEL	Coolant Level	4-20 ma	J1-30 source, J1-29 return
5	USER CFG 05 FUEL LEVEL	Analog Input #5 Fuel Level	4-20 ma	J1-7 source, J1-6 return
6	USER CFG 06 FUEL PRESSURE INLET TEMP	Analog Input #6 Fuel Pressure, Inlet Temperature	4-20 ma	J1-28 source, J1-27 return
7	USER CFG 07 THROT POS	Analog Input #7 Throttle Position	4-20 ma	J1-18 source, J1-17 return
8	USER CFG 08 EMISSIONS FLUID BASIN	Analog Input #8 Emissions Sensor, Fluid Basin Level	0-1 Volt	J1-5 source, J1-5 return
9	USER CFG 09 BAT CHARGE CUR	Analog Input #9 Battery Charge Current	0-10 Volt	J1-16 return
10	BATTERY VOLTS	Battery Voltage	0-30 Volt	J1-35 (+) J1-12 (-)
11	CURRENT PHS A	Phase A Current – single & three phase	0-3 ARMS	J2-12 (+) J2-11 (-)
12	CURRENT PHS B	Phase B Current – single & three phase	0-3 ARMS	J2-35 (+) J2-34 (-)
13	CURRENT PHS C CURRENT NEUTRAL	Phase C Current – three phase Current in Neutral – single phase	0-3 ARMS Derived	J2-10 (+) J2-9 (-) n/a
14	AVRG CURRENT	Average System Current	Derived	n/a
15	VOLT PHS A-B VOLT PHS A-N	Line-to-Line AB Voltage – three phase Line-to-Neutral AN Voltage – single	0-28.8 VRMS	J2-6
16	VOLT PHS B-C VOLT PHS B-N	Line-to-Line BC Voltage – three phase Line-to-Neutral BN Voltage – single	0-28.8 VRMS	J2-29
17	VOLT PHS C-A VOLT PHS A-B	Line-to-Line CA Voltage – three phase Line-to-Line AB Voltage – single phase	0-28.8 VRMS Derived	J2-17 n/a
18	AVRG VOLTAGE	Average Line-to-Line System Voltage	Derived	n/a
19	TOTAL POWER KW	Total System Real Power	Derived	n/a
20	TOTAL PF	Total System Power Factor	Derived	n/a
21	GEN FREQUENCY	Generator Frequency	Derived	n/a
22	ENGINE RPM	Engine RPM	Hall Affect	J1-24 (-) J1-25 (+)
23	O2 DUTY CYCLE	Oxygen Sensor Measured Duty Cycle	Derived	n/a

◆ H-100 DIGITAL OUTPUTS

H-100 Number	GenLink Number	Signal Description	Connector Pin
1	1	Starter Relay (reserved)	J1-23
2	2	Fuel Relay (reserved)	J1-11
3	3	Fault Relay (reserved)	J1-34
4	4	13.3L Gas Relay (reserved for ILC on 13.3L gas)	J1-22
5	5	Auxiliary #1	J2-23
6	6	Auxiliary #2	J2-22
7	7	Auxiliary #3	J2-33
8	8	Auxiliary #4	J2-21
9	9	13.3L Ignition Module (reserved for ILC on 13.3L gas)	J2-32
10	n/a	Overspeed Shutdown (reserved – no software control)	J1-10
11	28	Throttle Driver PWM (reserved for H-100 governed generators)	J1-33
12	25	PreHeat Relay – diesel only (reserved)	J1-21
	26	Air/Fuel Ratio PWM – gas only (reserved)	
13	31	AVR Field Control (reserved)	J2-20
14	32	AVR Field Control (reserved)	J2-8

◆ H-100 DIGITAL INPUTS

Number	Default Signal Name	Signal Description	Connector Pin
1	AUTO SWITCH	Key Switch in AUTO	J2-5
2	MANUAL SWITCH	Key Switch in MANUAL	J2-28
3	EMERGENCY STOP	Emergency Stop Status	J2-16
4	REMOTE START	Remote Start	J2-4
5	DI1/USR CFG 05 BAT CHRGR FAIL	DI-1, Battery Charger Fail	J2-27
6	DI2/USR CFG 06 RUPTURED BASIN PROP GAS LEAK DI2/FUEL PRESSURE	DI-2, Ruptured Basin, Propane Gas Leak, Low Fuel Pressure	J2-15
7	DI3/USR CFG 07 DI3/LINE POWER	DI-3, Line Power	J2-3
8	DI4/USR CFG 08 DI4/GEN POWER	DI-4, Generator Power	J2-26
9	MODEM DCD USR CFG 09	Modem DCD User configurable (reserved if Modem)	J1-14
10	MODEM ENABLED	Modem Enable	J1-26
11	GEN OVERSPEED	Generator Overspeed Detected	Internal

◆ H-100 DIGITAL OUTPUT FUNCTIONS

Number	Default Function Name	Function Description
1	COMMON ALARM	An alarm is active
2	COMMON WARNING	A warning is active
3	GEN RUNNING	Generator is running
4	ALARMS ENABLED	All alarm hold off delays have expired, so all alarms are enabled
5	READY FOR LOAD	Generator is warmed up and ready to accept power loading
6	GEN READY TO RUN	Generator is ready to start
7	GEN STOPPED-ALRM	Generator stopped due to a shutdown alarm
8	GEN STOPPED	Generator is stopped
9	GEN IN MANUAL	Generator in MANUAL mode (key switch in MANUAL or ILC overriden)
10	GEN IN AUTO	Generator in AUTO mode (key switch in AUTO or ILC overriden)
11	GEN IN OFF	Generator in OFF mode (key switch in OFF or ILC overriden)
12	OVERCRANK ALARM	Generator has unsuccessfully tried to start the designated number of times
13	OIL INHIBIT ALRM	Oil pressure too high for a stopped engine
14	ANNUNC SPR LIGHT	ILC controlled: this function operates the spare remote annunciator light
15	OIL TEMP HI ALRM	Oil Temperature has gone above maximum alarm limit
16	OIL TEMP LO ALRM	Oil Temperature has gone below minimum alarm limit
17	OIL TEMP HI WARN	Oil Temperature has gone above maximum warning limit
18	OIL TEMP LO WARN	Oil Temperature has gone below maximum warning limit
19	OIL TEMP FAULT	Oil Temperature sensor exceeds nominal limits for valid sensor reading
20	COOL TMP HI ALRM	Coolant Temperature has gone above maximum alarm limit
21	COOL TMP LO ALRM	Coolant Temperature has gone below minimum alarm limit
22	COOL TMP HI WARN	Coolant Temperature has gone above maximum warning limit
23	COOL TMP LO WARN	Coolant Temperature has gone below maximum warning limit
24	COOL TMP FAULT	Coolant Temperature sensor exceeds nominal limits for valid sensor reading
25	OIL PRES HI ALRM	Oil Pressure has gone above maximum alarm limit
26	OIL PRES LO ALRM	Oil Pressure has gone below minimum alarm limit
27	OIL PRES HI WARN	Oil Pressure has gone above maximum warning limit
28	OIL PRES LO WARN	Oil Pressure has gone below maximum warning limit
29	OIL PRES FAULT	Oil Pressure sensor exceeds nominal limits for valid sensor reading
30	COOL LVL HI ALRM	Coolant Level has gone above maximum alarm limit
31	COOL LVL LO ALRM	Coolant Level has gone below minimum alarm limit
32	COOL LVL HI WARN	Coolant Level has gone above maximum warning limit
33	COOL LVL LO WARN	Coolant Level has gone below maximum warning limit
34	COOL LVL FAULT	Coolant Level sensor exceeds nominal limits for valid sensor reading
35	ANALOG 5 HI ALRM FUEL LVL HI ALRM	Analog Input #5 has gone above maximum alarm limit Fuel Level
36	ANALOG 5 LO ALRM FUEL LVL LO ALRM	Analog Input #5 has gone below minimum alarm limit Fuel Level
37	ANALOG 5 HI WARN FUEL LVL HI WARN	Analog Input #5 has gone above maximum warning limit Fuel Level
38	ANALOG 5 LO WARN FUEL LVL LO WARN	Analog Input #5 has gone below maximum warning limit Fuel Level
39	ANALOG 5 FAULT FUEL LVL FAULT	Analog Input #5 sensor exceeds nominal limits for valid sensor reading Fuel Level
40	ANALOG 6 HI ALRM FUEL PRS HI ALRM INLT TMP HI ALRM	Analog Input #6 has gone above maximum alarm limit Fuel Pressure Inlet Air Temperature
41	ANALOG 6 LO ALRM FUEL PRS LO ALRM INLT TMP LO ALRM	Analog Input #6 has gone below minimum alarm limit Fuel Pressure Inlet Air Temperature

Number	Default Function Name	Function Description
42	ANALOG 6 HI WARN FUEL PRS HI WARN INLT TMP HI WARN	Analog Input #6 has gone above maximum warning limit Fuel Pressure Inlet Air Temperature
43	ANALOG 6 LO WARN FUEL PRS LO WARN INLT TMP LO WARN	Analog Input #6 has gone below maximum warning limit Fuel Pressure Inlet Air Temperature
44	ANALOG 6 FAULT FUEL PRS FAULT INLT TMP FAULT	Analog Input #6 sensor exceeds nominal limits for valid sensor reading Fuel Pressure Inlet Air Temperature
45	ANALOG 7 HI ALRM GOV POS HI ALARM	Analog Input #7 has gone above maximum alarm limit Throttle Position
46	ANALOG 7 LO ALRM GOV POS LO ALARM	Analog Input #7 has gone below minimum alarm limit Throttle Position
47	ANALOG 7 HI WARN GOV POS HI WARN	Analog Input #7 has gone above maximum warning limit Throttle Position
48	ANALOG 7 LO WARN GOV POS LO WARN	Analog Input #7 has gone below maximum warning limit Throttle Position
49	ANALOG 7 FAULT GOV POS FAULT	Analog Input #7 sensor exceeds nominal limits for valid sensor reading Throttle Position
50	ANALOG 8 HI ALRM OXYGEN HI ALARM FLUID BS HI ALRM	Analog Input #8 has gone above maximum alarm limit Emissions Sensor Fluid Basin
51	ANALOG 8 LO ALRM OXYGEN LO ALRM FLUID BS LO ALRM	Analog Input #8 has gone below minimum alarm limit Emissions Sensor Fluid Basin
52	ANALOG 8 HI WARN OXYGEN HI WARN FLUID BS HI WARN	Analog Input #8 has gone above maximum warning limit Emissions Sensor Fluid Basin
53	ANALOG 8 LO WARN OXYGEN LO WARN FLUID BS LO WARN	Analog Input #8 has gone below maximum warning limit Emissions Sensor Fluid Basin
54	ANALOG 8 FAULT O2 SENSOR FAULT FLUID BS FAULT	Analog Input #8 sensor exceeds nominal limits for valid sensor reading Emissions Sensor Fluid Basin
55	ANALOG 9 HI ALRM CHG CURR HI ALRM	Analog Input #9 has gone above maximum alarm limit Battery Charge Current
56	ANALOG 9 LO ALRM CHG CURR LO ALRM	Analog Input #9 has gone below minimum alarm limit Battery Charge Current
57	ANALOG 9 HI WARN CHG CURR HI WARN	Analog Input #9 has gone above maximum warning limit Battery Charge Current
58	ANALOG 9 LO WARN CHG CURR LO WARN	Analog Input #9 has gone below maximum warning limit Battery Charge Current
59	ANALOG 9 FAULT CHG CURR FAULT	Analog Input #9 sensor exceeds nominal limits for valid sensor reading Battery Charge Current
60	BAT VOLT HI ALRM	Battery Voltage has gone above maximum alarm limit
61	BAT VOLT LO ALRM	Battery Voltage has gone below minimum alarm limit
62	BAT VOLT HI WARN	Battery Voltage has gone above maximum warning limit

Number	Default Function Name	Function Description
63	BAT VOLT LO WARN	Battery Voltage has gone below maximum warning limit
64	AVG CURR HI ALRM	Average Current has gone above maximum alarm limit
65	AVG CURR LO ALRM	Average Current has gone below minimum alarm limit
66	AVG CURR HI WARN	Average Current has gone above maximum warning limit
67	AVG CURR LO WARN	Average Current has gone below maximum warning limit
68	AVG VOLT HI ALRM	Average Voltage has gone above maximum alarm limit
69	AVG VOLT LO ALRM	Average Voltage has gone below minimum alarm limit
70	AVG VOLT HI WARN	Average Voltage has gone above maximum warning limit
71	AVG VOLT LO WARN	Average Voltage has gone below maximum warning limit
72	TOT PWR HI ALARM	Total Real Power has gone above maximum alarm limit
73	TOT PWR LO ALARM	Total Real Power has gone below minimum alarm limit
74	TOT PWR HI WARN	Total Real Power has gone above maximum warning limit
75	TOT PWR LO WARN	Total Real Power has gone below maximum warning limit
76	GEN FREQ HI ALRM	Generator Frequency has gone above maximum alarm limit
77	GEN FREQ LO ALRM	Generator Frequency has gone below minimum alarm limit
78	GEN FREQ HI WARN	Generator Frequency has gone above maximum warning limit
79	GEN FREQ LO WARN	Generator Frequency has gone below maximum warning limit
80	GEN FREQ FAULT	Generator Frequency exceeds nominal limits for valid sensor reading
81	ENG RPM HI ALARM	Engine RPM has gone above maximum alarm limit
82	ENG RPM LO ALARM	Engine RPM has gone below minimum alarm limit
83	ENG RPM HI WARN	Engine RPM has gone above maximum warning limit
84	ENG RPM LO WARN	Engine RPM has gone below maximum warning limit
85	ENG RPM FAULT	Engine RPM exceeds nominal limits for valid sensor reading
86	SWITCH IN AUTO	Key Switch in AUTO digital input active
87	SWITCH IN MANUAL	Key Switch in MANUAL digital input active
88	E-STOP ACTIVE	Emergency Stop Status digital input active
89	REMOTE START ACT	Remote Start digital input active
90	DIG INPUT 05 ACT BATT CHARGE FAIL	DI-1, Digital Input #5 active Battery Charger Fail digital input active
91	DIG INPUT 06 ACT RUPTURED BASIN PROP LEAK ACT LOW FUEL PRS ACT	DI-2, Digital Input #6 active Ruptured Basin digital input active, Propane Gas Leak digital input active, Low Fuel Pressure digital input active
92	DIG INPUT 07 ACT LINE POWER ACT	DI-3, Digital Input #7 active Line Power digital input active
93	DIG INPUT 08 ACT GEN POWER ACT	DI-4, Digital Input #8 active Generator Power digital input active
94	DIG INPUT 09 ACT MODEM DCD ACT	Digital Input #9 active Modem Carrier Detect digital input active
95	MODEM ENAB ACT	Modem Enable digital input active
96	ILC ALR/WRN #1	ILC controlled: ILC warning or alarm signal # 1
97	ILC ALR/WRN #2	ILC controlled: ILC warning or alarm signal # 2
98	IN WARM UP	Generator is running, but not fully warmed up yet
99	IN COOL DOWN	Generator is running, but cooling down before shutting off.
100	CRANKING	Generator is starting – the starter is engaged
101	NEED SERVICE	Maintenance item has expired
102	SHUTDOWN GENSET	Shutdown alarm is active

Number	Default Function Name	Function Description
103	CHCK V PHS ROT	Detected voltage phase rotation as not being A-B-C
104	CHCK C PHS ROT	Detected current phase rotation as not being A-B-C and not matching voltage
105	FAULT RLY ACTIVE	Audible alarm/warning signal is active.
106	USR CONFIG 106	GenLink controlled: GenLink front panel radio button selected
107	INT EXERCISE ACT	Internal Exercise is active – includes QuietTest®
108	CHECK FOR ILC	Indicates the ILC is not running
109	USR CONFIG 109	Available for ILC use
110	USR CONFIG 110	Available for ILC use
111	USR CONFIG 111	Available for ILC use
112	USR CONFIG 112	Available for ILC use
113	USR CONFIG 113	Available for ILC use
114	USR CONFIG 114	Available for ILC use
115	USR CONFIG 115	Available for ILC use
116	USR CONFIG 116	Available for ILC use
117	USR CONFIG 117	Available for ILC use
118	USR CONFIG 118	Available for ILC use
119	USR CONFIG 119	Available for ILC use
120	USR CONFIG 120	Available for ILC use

◆ H-100 CONNECTOR PIN DESCRIPTIONS

J1	Wire	Signal	Description	J2	Wire	Signal	Description
1		CAN (rtn)	CAN Bus	1	391	RS485 (-)	Diagnostic/Rem-An/HTS
2		CAN (+)	CAN Bus (+)	2	388	RS232 (tx)	GenLink
3	810	Gnd	Modem Power (-)	3	IN7	IN (DB) 7	DI-3/Line Power
4	805	AN8 (rtn)	Emissions Sensor/ Fluid Basin Level	4	183	IN (DB) 4	Remote Start
5	804	AN8 (+) 0-1V	Emissions Sensor/ Fluid Basin Level	5	174	IN (DB) 1	Key Switch in AUTO
6	575R	AN5 (rtn)	Fuel Level	6	224	Vsense 1	Phase AB Voltage
7	575V	AN5 (+) 4-20mA	Fuel Level	7	227	Gnd	Vsense PCB Ground
8	523R	AN1 (rtn)	Oil Temperature	8	403	OUT (OC) 14	AVR Gate trigger 'B'
9	523V	AN1 (+) 4-20mA	Oil Temperature	9	399C	CT3 (-)	Phase C Current
10	R15B	OUT (OC) 10	Overspd Shutdown	10	398C	CT3 (+)	Phase C Current
11	256	OUT (OC) 2	Fuel Relay	11	399A	CT1 (-)	Phase A Current
12	0	- Batt (12/24V)	Panel Power (-)	12	398A	CT1 (+)	Phase A Current
13		CAN (-)	CAN Bus (-)	13	390	RS485 (+)	Diagnostic/Rem-An/HTS
14	811	IN (DB) 9	Modem DCD	14	387	RS232 (rx)	GenLink
15	68V	AN2 (+) 4-20mA	Coolant Temperature	15	567/601	IN (DB) 6	DI-2/Ruptured Basin/ Low Fuel Pressure
16	803	AN9(+) 0-5V	Battery Charger Cur	16	R15	IN (DB) 3	Emergency Stop
17	766R	AN7 (rtn)	Throttle Position	17	226	Vsense 3	Phase CA Voltage
18	766V	AN7 (+) 4-20mA	Throttle Position	18		+12V (500 mA)	Vsense PCB
19	69R	AN3 (rtn)	Oil Pressure	19	405	Gnd	AVR PCB Power (-)
20	69V	AN3 (+) 4-20mA	Oil Pressure	20	404	OUT (OC) 13	AVR Gate trigger 'A'
21	221/808	OUT (OC)12 (PWM)	Preheat/Air /Fuel Solenoid	21	OC8	OUT (OC) 8	Auxiliary 4 Output
22	242	OUT (OC) 4	13.3 Gas Relay	22	OC6	OUT (OC) 6	Auxiliary 2 Output
23	56A	OUT (OC) 1	Starter Relay	23	OC5	OUT (OC) 5	Auxiliary 1 Output
24	0/shld	RPM sensor (-)	Engine RPM	24	SHLD	RS485 (shield)	Diagnostic/Rem-An/HTS
25	79	RPM sensor (+)	Engine RPM	25	389	RS232 (com)	GenLink
26	812	IN (DB) 10	Modem Enable	26	IN8	IN (DB) 8	DI-4/Generator Power
27	AI1R/806/ 754R	AN6 (rtn)	Fuel Press/Ign. Alarm/ Inlet Temp	27	505	IN (DB) 5	DI-1/Battery Charger Fail
28	AI1S/ 754V	AN6 (+) 4-20mA	Fuel Press/ Inlet Temp	28	175	IN (DB) 2	Key Switch in MANUAL
29	573R	AN4 (rtn)	Coolant Level	29	225	Vsense 2	Phase BC Voltage
30	573V	AN4 (+) 4-20mA	Coolant Level	30	406	AVR Zero Crossing	AVR Zero Crossing Input
31	68R	AN2 (rtn)	Coolant Temp	31	194	+12V (300 mA)	AVR PCB Power (+)
32	809	+12V (300mA)	Modem Power (+)	32	OC9/25	OUT (OC) 9	13.3 Ignition Power
33	769	OUT (OC)11 (PWM)	Throttle Driver	33	OC7	OUT (OC) 7	Auxiliary 3 Output
34	445	OUT (OC) 3	Fault Relay	34	399B	CT2 (-)	Phase B Current
35	15B/220B	+ Batt (12/24V)	Panel Power (+)	35	398B	CT2 (+)	Phase B Current

KEY:

OUT (O/C) #1-14 = Digital OUTput, Open Collector (includes PWM Outputs, AVR Gates)

IN (DB) #1-10 = Digital INput, Buffered (Schmitt Trigger) "Pulled up"

AN #1-7 (+) = Analog 12V (50 mA) source

AN #1-7 (rtn) = General purpose analog input (4 - 20 mA)

Vsense #1-3 = Voltage sensing input (0 - 28.8 VAC)

CT #1-3 = Current Transformer input (0 - 3 A AC)

APPENDIX C — MISCELLANEOUS H-100 INTERNAL ALARMS/WARNINGS

"Strt Inhib:Oil" – Oil pressure is higher than expected for a stopped engine.

"Overcrank" – Generator has attempted to start the designated number of times without success.

"Mult Def Digtl" – More than one Digital Output Function is assigned to the same Digital Output; or A Digital Output Function is assigned to a reserved Digital Output.

"Mult Def Analg" – More than one Analog Input is assigned to the same Analog Output; or An Analog Input is assigned to a reserved Analog Output.

"WatchDog Fail" – Firmware was unable to complete all its tasks in the allotted time.

"HW Overspeed" – Hardware Generator Overspeed circuit has detected a generator overspeed condition.

"System Reset" – Microprocessor has reset unexpectedly.

"i2t Gen Tmp HI" – i2t logic has determined alternator temperature is too high.

"300% Rated Cur" – >300% rated current short present – current is being controlled to 300%.

"Eng Stall RPM" – Engine has stalled unexpectedly.

"No HTS # Comms" – HTS number '#' is not communicating.

"HTS # SW Fault" – HTS number '#' failed in its switching attempt.

"HTS # Not Sync" – HTS number '#' was unable to synchronize with utility in the allotted time.

"HTS # Batt Low" – HTS number '#' battery is weak and possibly needs replacing.

"No HTS # Batt" – HTS number '#' battery is not connected.

NOTES

NOTES

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Part No. 0F3750 **Revision A (03/13/06)** **Printed in U.S.A.**